THE

SILVA OF NORTH AMERICA

BY

CHARLES SPRAGUE SARGENT

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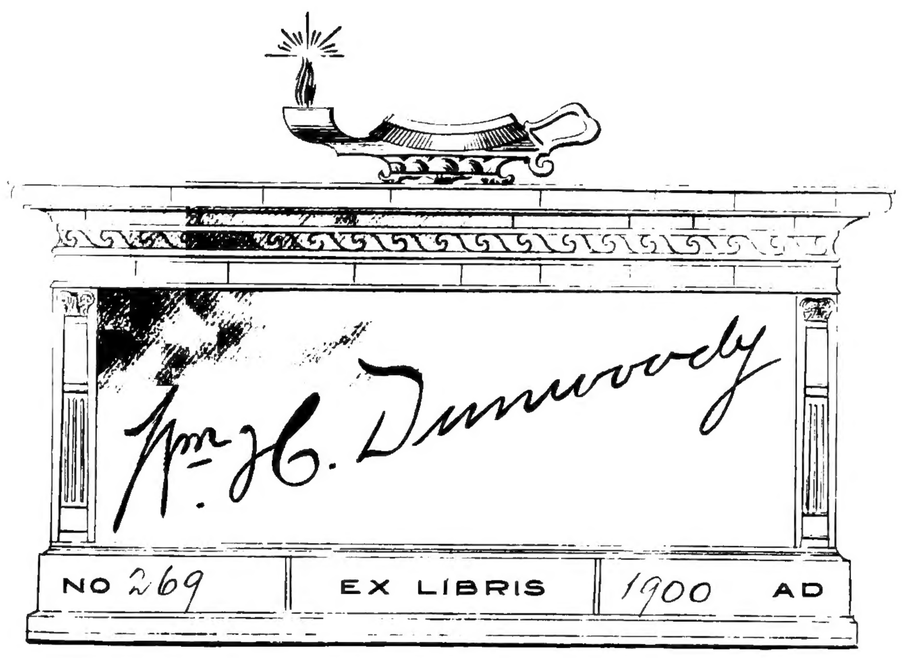

THE

SILVA OF NORTH AMERICA

A DESCRIPTION OF THE TREES WHICH GROW NATURALLY IN NORTH AMERICA EXCLUSIVE OF MEXICO

BY

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Illustrated with Figures and Analyses drawn from Nature

BY

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VOLUME V.

HAMAMELIDEÆ—SAPOTACEÆ

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To

FREDERICK LAW OLMSTED,

THE GREAT ARTIST

WHOSE LOVE FOR NATURE HAS BEEN A PRICELESS BENEFIT

TO HIS FELLOW-COUNTRYMEN,

THIS FIFTH VOLUME OF

THE SILVA OF NORTH AMERICA

IS AFFECTIONATELY

DEDICATED.

SYNOPSIS OF THE ORDERS OF PLANTS CONTAINED IN VOLUME V. OF THE SILVA OF NORTH AMERICA.

CLASS I. **DICOTYLEDONOUS or EXOGENOUS PLANTS.**

Stems increasing in diameter by the annual addition of a layer of wood inside the bark. Leaves netted-veined. Embryo with a pair of opposite cotyledons.

SUB-CLASS I. **Angiospermæ.** Pistil, a closed ovary containing the ovules and developing into the fruit.

DIVISION I. **Polypetalæ.** Flowers with calyx and corolla, the latter divided into separate petals.

C. **CALYCIFLORÆ.** Sepals rarely distinct. Disk adnate to the base of the calyx, rarely tumid or conspicuous or wanting. Petals usually as many as the lobes of the calyx, or fewer by abortion, inserted on the margin of the calyx-tube or of the disk, occasionally wanting. Stamens definite or indefinite, perigynous or hypogynous. Ovary superior or inferior.

22. **Hamamelideæ.** Flowers often polygamo-monœcious. Petals often wanting. Stamens few or indefinite. Ovary inferior or partly superior, of 2 carpels, free at the apex. Ovules few or solitary, suspended, anatropous. Seeds albuminous. Leaves usually alternate, stipulate.

23. **Rhizophoraceæ.** Flowers usually perfect. Petals 3 to 14. Stamens two to four times as numerous as the petals. Ovary 2 to 6-celled, usually superior. Ovules 2, rarely 4 or more, anatropous. Seeds exalbuminous or rarely albuminous. Leaves usually opposite and stipulate, occasionally alternate and exstipulate.

24. **Combretaceæ.** Flowers usually perfect. Petals 0 or 4 to 5. Stamens 4 to 5 or 8 to 10. Ovary 1-celled. Ovules 2 to 6 or rarely solitary, anatropous. Seeds exalbuminous. Leaves opposite or alternate, exstipulate.

25. **Myrtaceæ.** Flowers usually perfect. Petals 4 to 5, rarely 6, or 0. Stamens indefinite. Ovary usually inferior, 2 to many-celled, or rarely 1-celled. Ovules 2 or many, amphitropous. Seeds exalbuminous. Leaves opposite or rarely alternate, exstipulate.

26. **Cactaceæ.** Flowers perfect. Petals and stamens indefinite. Ovary inferior, 1 or 2 or many-celled. Ovules numerous, anatropous. Seeds albuminous. Leaves minute or 0, or rarely large and fleshy.

27. **Araliaceæ.** Flowers perfect. Petals and stamens usually 5. Ovary inferior, 1 to 2 or many-celled. Ovule solitary, anatropous. Seeds albuminous. Leaves alternate or rarely opposite, usually compound.

28. **Cornaceæ.** Flowers regular, perfect. Petals and stamens usually 5. Ovary inferior, 1 to 4-celled. Ovules 1 or rarely 2, anatropous. Seeds albuminous. Leaves opposite or rarely alternate, entire.

DIVISION II. **Gamopetalæ.** Petals usually united. Stamens inserted on the corolla alternate with or opposite its lobes, or free from the corolla. Ovary inferior or superior.

29. **Caprifoliaceæ.** Flowers perfect, regular or irregular, 4 to 5-merous. Stamens inserted on the corolla, and usually as many as its lobes. Ovary inferior, 2 to 8-celled. Ovules 2 or many, anatropous. Seeds albuminous. Leaves opposite, rarely stipulate.

30. **Rubiaceæ.** Flowers perfect, regular, 4 to 5-merous. Stamens inserted on the corolla and as many as its lobes. Ovary inferior, 2 to 4-celled. Ovules usually numerous, anatropous, or amphitropous. Seeds albuminous or rarely exalbuminous. Leaves simple, opposite or verticillate, stipulate.

31. **Ericaceae.** Flowers regular, perfect, 4 to 5-merous. Stamens free from the corolla. Ovary inferior or superior. Ovules numerous or rarely solitary, anatropous. Seeds albuminous. Leaves alternate or opposite, exstipulate.

32. **Myrsineaceæ.** Flowers regular, perfect or polygamo-dicœcious. Stamens inserted on the corolla opposite its lobes. Ovary superior, 1-celled, with a free central placenta. Ovules few or numerous, amphitropous or anatropous. Seeds albuminous. Leaves alternate or rarely opposite, exstipulate.

35. **Sapotaceæ.** Flowers regular, perfect, 4 to 5-merous. Stamens inserted on the corolla opposite its lobes. Ovary superior, few or many-celled. Ovule solitary, amphitropous. Seeds albuminous or exalbuminous. Leaves alternate or rarely subopposite, exstipulate or rarely stipulate.

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SILVA OF NORTH AMERICA.

HAMAMELIS.

FLOWERS usually perfect; calyx deeply 4-parted, the lobes imbricated in æstivation; petals 4, elongated-linear, involute in æstivation; stamens 8, those opposite the petals rudimentary and scale-like; ovary 2-celled; ovules suspended. Fruit a woody capsule, loculicidally dehiscent from the apex. Leaves alternate, stipulate, deciduous.

Hamamelis, Linnæus, *Gen.* ed. 2, 54 (1742). — A. L. de Jussieu, *Gen.* 288. — Meisner, *Gen.* 153. — Endlicher, *Gen.* 804. — Oliver, *Trans. Linn. Soc.* xxiii. 459. — Bentham & Hooker, *Gen.* i. 667. — Baillon, *Hist. Pl.* iii. 456 (excl. *Loropetalum*). — Engler & Prantl, *Pflanzenfam.* iii. pt. ii. 128.

Trilopus, Mitchell, *Act. Nat. Cur.* viii. Appx. 219 (1748). — Adanson, *Fam. Pl.* ii. 381.

Trees or shrubs, with scaly bark, terete zigzag branchlets, naked buds, and fibrous roots. Leaves involute in vernation, alternate, unsymmetrical at the base, crenate-toothed, the primary veins conspicuous and nearly parallel with the margins, deciduous; stipules acute, infolding the buds, deciduous.[1] Flowers autumnal or hyemal, perfect or polygamous,[2] in terminal three-flowered clusters borne on axillary simple, or rarely branched peduncles furnished near the middle with two acute deciduous bractlets, each flower surrounded by two or three ovate acute bracts, the outer slightly united at the base into a three-lobed involucre. Calyx deeply four-parted, persistent on the base of the ovary, the lobes reflexed. Petals inserted on the margin of the cup-shaped receptacle, alternate with the sepals, strap-shaped. Stamens eight in two rows, inserted on the margin of the receptacle, the four opposite the lobes of the calyx fertile, the others reduced to minute strap-shaped scales; filaments free, shorter than the calyx, prolonged into the thickened pointed connective; anthers muticous, attached at the base, two-celled, introrse, the elliptical cells opening laterally from within by persistent valves. Ovary composed of two carpels free at their apex, inserted in the bottom of the receptacle, partly superior; styles subulate, spreading, stigmatic at the apex, persistent; ovules one, or two in each cell[3] becoming solitary by abortion, suspended from the apex of the axile placenta; micropyle superior, raphe ventral. Fruit capsular, partly superior, two-beaked at the apex, the thick and woody exocarp splitting from above loculicidally before the opening of the thin crustaceous endocarp. Seed oblong, acute, suspended; testa

[1] In the American species the stipules only partially inclose the winter-bud and fall away from the upper leaf, that is, the last leaf formed in the previous autumn, as it begins to expand, although they generally remain during the spring and early summer on the leaves which unfold after the opening of the bud. On *Hamamelis mollis*, a native of China, the stipules are more developed than on the other species and entirely inclose the winter-buds.

[2] The flowers of Hamamelis are described by many authors as polygamous and monœcious; in the American species, although varying somewhat in size on the same individual, they appear to be generally perfect.

[3] Baillon, *Adansonia*, x. 126.

crustaceous, chestnut-brown, shining.[1] Embryo surrounded by thick fleshy albumen; cotyledons oblong, foliaceous, longer than the radicle turned towards the oblong depressed hilum.

Hamamelis is confined to eastern America and eastern Asia. Three species are known; one is American, a second inhabits the mountain forests of Japan, and of central China,[2] where, in Kiangsi and Hupeh, the third species[3] occurs.

The appearance of the flowers of Hamamelis in autumn simultaneous with the ripening of the fruit of the previous year and after the foliage has assumed its autumnal colors, or in winter or early spring while the branches are bare of leaves, gives special interest to the species of this genus, which is not known to possess useful properties.

The American species of Hamamelis is not attacked by many insects,[4] or seriously affected by fungal diseases.[5]

The generic name, from ἅμα and μηλίς, once applied to the Medlar, or to some other plant resembling the Apple-tree, was first given by Linnæus to the American species.

[1] In *Hamamelis Virginiana* the seed is forcibly discharged to a considerable distance by the contraction of the edges of the valves of the bony endocarp, which in opening suddenly frees it by pressure and causes it to fly upwards (Elliott, *Sk.* i. 219. — Gray, *Am. Jour. Sci.* ser. 3, v. 144. — *Bot. Gazette*, vii. 125, 137).

[2] *Hamamelis Japonica*, Siebold & Zuccarini, *Abhand. Akad. Münch.* iv. pt. ii. 193 (1843). — Miquel, *Ann. Mus. Bot. Lugd. Bat.* iii. 21. — Franchet & Savatier, *Enum. Pl. Jap.* i. 163; ii. 368. — *Bot. Mag.* cviii. t. 6659. — Forbes & Hemsley, *Jour. Linn. Soc.* xxiii. 290. — Sargent, *Garden and Forest*, iv. 256, f. 45.

Hamamelis Virginiana, var. *Japonica*, Franchet, *Pl. David.* i. 131 (1884).

In Japan *Hamamelis Japonica* is found in southern Yezo and in the mountain forests of the three southern islands, where, in the neighborhood of streams, it is common at an elevation of from two to four thousand feet above the sea, often becoming a tree thirty to forty feet in height with a short stout trunk sometimes eighteen inches in diameter; or, under less favorable conditions, a straggling many-stemmed shrub. In China it has been found in the neighborhood of Kiukiang in Kiangsi. The flowers of the Japanese plant are rather smaller than those of the American species, and on plants cultivated in the United States and in Europe appear in winter or in very early spring; they vary in color, one form producing flowers with calyx-lobes claret-colored on the inner surface and with light yellow petals (*Hamamelis arborea*, Masters, *Gard. Chron.* n. ser. xv. 216, f. 38 [1881]; ser. 3, ix. 248, f. 55. — *The Garden*, xxxvii. 79; xxxix. 546, t. — André, *Rev. Hort.* 1891, 472, t.); while in the other the calyx-lobes are a light yellowish brown and the petals canary-yellow (*Hamamelis Zuccariniana*, *The Garden*, xxxv. 309 [1889]).

In its native country the foliage of *Hamamelis Japonica* during the months of October and November enlivens the forests with shades of brilliant orange, or rarely of deep vinous red.

[3] *Hamamelis mollis*, Oliver, *Hooker Icon.* xviii. t. 1742 (1888). — Forbes & Hemsley, *Jour. Linn. Soc.* xxiii. 290.

[4] Few insects are described as living upon Hamamelis in the United States or as affecting it injuriously. Packard (*5th Report U. S. Entomolog. Comm.* 1886–1890, 668) enumerates six species, and a number of others are known. Larvæ of such moths as *Scopelosoma Moffatiana*, Grote, and *Halesidota Caryæ*, Clemens, devour the leaves, while several species of the small Tortricids, or Leaf-miners, like *Gracilaria superbifrontella*, Clemens, and *Catastega hamameliella*, Clemens, feed upon or mine within the parenchyma. The most conspicuous and peculiar injuries to Hamamelis are caused by two aphid-galls, one affecting the leaves, the other the fruit. The first of these, *Hormaphis Hamamelidis*, Osten Sacken, makes cone-shaped galls on the upper surface of the leaves; the other, *Hormaphis spinosus*, Osten Sacken, infests the young fruit after it begins to grow in spring, causing it to develop into a hollow gall as large as the mature fruit or larger, covered on the outside with spines, and filled with aphids and their liquid secretions (*Trans. Am. Entomolog. Soc.* i. 284). Bees and wasps are often attracted in large numbers to Hamamelis in search of the secretions of these aphids, which appear to be peculiar to the genus.

[5] In America Hamamelis is subject to no serious fungal disease, although the leaves of *Hamamelis Virginiana* are inhabited by several small and peculiar species of fungi of considerable interest to botanists. Of these the mildew *Podosphæra biuncinata*, Cooke & Peck, with its well-marked appendages, is a characteristic North American species. *Phyllosticta Hamamelidis*, Cooke, *Ramularia Hamamelidis*, Peck, and *Cercospora Hamamelidis*, Ellis & Everhart, form discolored spots on the leaves, and are slightly injurious to the plant.

HAMAMELIS VIRGINIANA.

Witch Hazel.

FLOWERS autumnal. Leaves obovate or oval, usually acute at the apex.

Hamamelis Virginiana, Linnæus, *Spec.* ed. 2, 180 (1762). — Miller, *Dict.* ed. 8. — Moench, *Bäume Weiss.* 48. — Marshall, *Arbust. Am.* 58. — Du Roi, *Harbk. Baumz.* i. 297. — Castiglioni, *Viag. negli Stati Uniti*, ii. 258. — Wangenheim, *Nordam. Holz.* 87, t. 29, f. 62. — Lamarck, ***Dict.*** iii. 68; *Ill.* i. 350, t. 88. — Willdenow, *Berl. Baumz.* 139; *Spec.* i. 701. — Schkuhr, *Handb.* i. 88, t. 27. — Michaux, *Fl. Bor.-Am.* i. 100. — Borkhausen, *Handb. Forstbot.* ii. 1568. — Persoon, *Syn.* i. 150. — Du Mont de Courset, *Bot. Cult.* ed. 2, v. 153. — Desfontaines, *Hist. Arb.* ii. 29. — Pursh, *Fl. Am. Sept.* i. 116. — Bigelow, *Fl. Boston.* 40. — Nuttall, *Gen.* i. 107. — *Nouveau Duhamel*, vii. 207, t. 60. — Elliott, *Sk.* i. 219. — Roemer & Schultes, *Syst.* iii. 483. — Loddiges, *Bot. Cab.* vi. t. 598. — Barton, *Fl. N. Am.* iii. 21, t. 78. — Torrey, *Fl. N. Y.* i. 260. — Guimpel, Otto & Hayne, *Abbild. Holz.* 95, t. 75. — Sprengel, *Syst.* i. 491. — Rafinesque, *Med. Fl.* i. 227, f. 45. — De Candolle, *Prodr.* iv. 268. — Hooker, *Fl. Bor.-Am.* i. 275. — Don, *Gen. Syst.* iii. 396. — Spach, *Hist. Vég.* viii. 79. — Dietrich, *Syn.* i. 550. — Torrey & Gray, *Fl. N. Am.* i. 597. — Darlington, *Fl. Cestr.* ed. 3, 98. — Agardh, *Theor. Syst. Pl.* t. 13, f. 7. — Schnizlein, *Icon.* t. 167, f. 18–25, 27–29. — Chapman, *Fl.* 157. — Curtis, *Rep. Geolog. Surv. N. Car.* 1860, iii. 105. — Koch, *Dendr.* ii. 458. — Baillon, *Hist. Pl.* iii. 389, f. 462–464; *Dict. Bot.* iii. 10. — Emerson, *Trees Mass.* ed. 2, ii. 472, t. — Le Maout & Decaisne, *Traité Gén. Bot.* 271, f. — Lauche, *Deutsche Dendr.* ed. 2, 545, f. 220. — Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix. 85. — Watson & Coulter, *Gray's Man.* ed. 6, 179. — Engler & Prantl, *Pflanzenfam.* iii. pt. ii. 128, f.

Hamamelis dioica, Walter, *Fl. Car.* 255 (1788). — Gmelin, *Syst.* ii. 282.

Hamamelis androgyna, Walter, *Fl. Car.* 255 (1788). — Gmelin, *Syst.* ii. 281. — *Selt. Am. Gewäch.* 13, t. 25.

Hamamelis corylifolia, Moench, *Meth.* 273 (1794).

Hamamelis macrophylla, Pursh, *Fl. Am. Sept.* i. 116 (1814). — Poiret, *Lam. Dict.* Suppl. v. 698. — Elliott, *Sk.* i. 220. — Roemer & Schultes, *Syst.* iii. 483. — Rafinesque, *Med. Fl.* i. 230. — Don, *Gen. Syst.* iii. 396.

Hamamelis Virginiana, var. **parvifolia**, Nuttall, *Gen.* i. 107 (1818). — Torrey, *Fl. U. S.* 193. — Don, *Gen. Syst.* iii. 396. — Torrey & Gray, *Fl. N. Am.* i. 597.

Hamamelis parvifolia, Rafinesque, *Med. Fl.* i. 230 (1828).

Trilopus Virginica, Rafinesque, *New Fl.* iii. 15 (1836).

Trilopus nigra, Rafinesque, *New Fl.* iii. 16 (1836).

Trilopus rotundifolia, Rafinesque, *New Fl.* iii. 16 (1836).

Trilopus estivalis, Rafinesque, *New Fl.* iii. 16 (1836).

Trilopus dentata, Rafinesque, *New Fl.* iii. 17 (1836).

Trilopus parvifolia, Rafinesque, *New Fl.* iii. 17 (1836).

A tree, occasionally twenty-five to thirty feet in height, with a short trunk twelve or fourteen inches in diameter, and spreading branches forming a broad open head; or usually a stout shrub sending up from the ground numerous rigid diverging stems from five to twenty feet tall. The bark of the trunk is an eighth of an inch thick, light brown, generally smooth, and covered with minute thin appressed scales which disclose in falling the dark reddish purple inner bark. The branchlets, which are alternate and lateral, are placed on the branches at an acute angle; they are thin and flexible, and vary greatly in length, the longest being usually near the end of the branches; at first they are coated with scurfy rusty stellate scales which gradually disappear during the summer; in their first winter they are glabrous or slightly puberulous, light orange-brown, and marked with occasional small white dots; and in their second year they become dark or reddish brown. The winter-buds are acute, slightly falcate, light orange-brown, and covered with short fine pubescence. The leaves are obovate, acuminate, long-pointed or sometimes rounded at the apex, and are very unequal at the base, the lower side being rounded or subcordate and larger than the upper, which is usually wedge-shaped; they are irregularly and coarsely serrate-toothed above the middle, and entire or dentate below, four to six inches long, two to two and a half inches broad, with stout midribs and six or seven pairs of primary veins terminating in the principal teeth, and are borne on stout petioles which vary from half an inch to nearly an inch in length; when they unfold, the veins, especially on the lower surface, and

the petioles and stipules, are coated with stellate ferrugineous pubescence; at maturity they are membranaceous, dull dark green on the upper surface, which is glabrous or pilose with occasional minute white hairs, and pubescent or puberulous especially along the midribs and principal veins on the lower surface, which is lighter colored and more lustrous than the upper. The stipules are lanceolate, acute, coriaceous, and from one third to half an inch long. In the autumn, before falling, the leaves turn a delicate yellow color. The clusters of flower-buds appear in August on short recurved peduncles developed from the axils of leaves of the year, and are covered, like the acute bracts and bractlets, with dark ferrugineous pubescence. The flowers open from the middle of September to the middle of November in different parts of the country; the calyx is at this season coated on the outer surface with thick pale pubescence, and is orange-brown on the inner surface, the rounded lobes being ciliate on the margins. The petals are bright yellow,[1] and half an inch to two thirds of an inch long, and, like the stamens, fall as soon as the ovules have been fertilized. During the winter the calyx-lobes surround and protect the pubescent ovary, which does not begin to enlarge until the following spring. The fruit ripens in the autumn, usually two from each flower-cluster, and discharges its seeds when the flowers of the season are expanding; it is half an inch long, pubescent, dull orange-brown, and is surrounded for half its length by the large persistent calyx bearing at its base the blackened remnants of the floral bracts.

Hamamelis Virginiana is distributed from Nova Scotia, New Brunswick, and the valley of the St. Lawrence River to southern Ontario,[2] Wisconsin, and eastern Nebraska,[3] and southward to northern Florida and eastern Texas. The Witch Hazel is one of the most common shrubs in the territory it inhabits, and is usually found on the borders of the forest in low rich soil or on the rocky banks of streams; it probably becomes a tree only on the slopes of the high Alleghany Mountains in North and South Carolina and Tennessee.

The wood of *Hamamelis Virginiana* is heavy, hard, and very close-grained, and contains numerous thin obscure medullary rays; it is light brown tinged with red, the thick sapwood, composed of from thirty to forty layers of annual growth, being nearly white. The specific gravity of the absolutely dry wood is 0.6856, a cubic foot weighing 42.72 pounds.

The bark and leaves of *Hamamelis Virginiana* are slightly astringent, and although not known to possess essential properties[4] are largely used by herbalists in the form of fluid extracts and decoctions,[5] and in homœopathic practice.[6]

The appearance of the flowers of the Witch Hazel late in the autumn as the fruit ripens and after the leaves have changed color gives it peculiar interest, and should secure for it a place in the shrubbery, where formerly it was more often seen than it is at present.[7]

Hamamelis Virginiana appears to have been first noticed by John Banister,[8] an English missionary in Virginia; and the earliest printed notice of it is found in the *Almagestum Botanicum* of

[1] Mr. Edward L. Rand has found in Malden, Massachusetts, a single plant on which the petals are all light red.

[2] Provancher, *Flore Canadienne*, i. 255. — Brunet, *Cat. Vég. Lig. Can.* 29. — Macoun, *Cat. Can. Pl.* i. 166.

[3] Bessey, *Bull. Exper. Stat. Nebraska*, iv. art. iv. 16.

[4] Gray, *Am. Jour. Sci.* ser. 2, xxiv. 438.

[5] The bark of Hamamelis first attracted attention as a remedy on account of its reputed use by the North American Indians in the treatment of external inflammations. It has been recommended by several practitioners for the treatment of hæmorrhage of the lungs and stomach, and for external applications. By distilling the bark in dilute alcohol "Pond's Extract" is made. The popularity of this medicine and the widespread belief in its value for external applications and for the treatment of nearly every form of disease have excited an unusual interest in Hamamelis, in which, however, chemists fail to distinguish any active medicinal properties. (See Rafinesque, *Med. Fl.* i. 227, f. 45. — Endlicher, *Enchirid. Bot.* 401. — Griffith, *Med. Bot.* 350, f. 165. — James Fountain, *N. Y. Jour. Med.* x. 208. — *Trans. Am. Med. Assoc.* i. 349. — *Nat. Dispens.* ed. 2, 704. — Baillon, *Traité Bot. Méd.* 768, f. 2398–2400. — Johnson, *Man. Med. Bot. N. Am.* 145, f. 127. — Parke, Davis & Co., *Organ. Mat. Med.* ed. 2, 197. — *U. S. Dispens.* ed. 16, 757.)

[6] Millspaugh, *Am. Med. Plants in Homœopathic Remedies*, i. 58, t. 58.

[7] Loudon, *Arb. Brit.* ii. 1007, f. 756, 757.

[8] See i. 6.

Plukenet, published in 1696.[1] According to Aiton,[2] it was introduced into English gardens in 1736 by Peter Collinson.[3]

It is propagated by seed, which should be sown as soon as gathered, when it will germinate in the second year.[4]

[1] *Pistachia Virginiana nigra Coryli foliis*, 298.

Hamamelis, Catesby, *Nat. Hist. Car.* ii. Appx. 2, t. 2. — Clayton, *Fl. Virgin.* 139. — Colden, *Cat. Pl. Novebor.* 89. — Duhamel, *Traité des Arbres*, i. 287, t. 114.

[2] *Hort. Kew.* i. 167.

[3] See i. 8.

[4] The popular name of this plant is due to the fact that it was early used by impostors to indicate the presence of precious metals in the soil and to discover springs of water. For this purpose a forked branch is twirled between the fingers and thumbs of the two hands; then at the place where the fork points water or gold is declared to exist.

EXPLANATION OF THE PLATE.

Plate CXCVIII. Hamamelis Virginiana.

1. A flowering and fruiting branch, natural size.
2. Diagram of a flower.
3. Vertical section of a flower, enlarged.
4. A pistil, enlarged.
5. A stamen, one of the anthers opening, front view, enlarged.
6. A stamen, rear view, enlarged.
7. A rudimentary stamen, enlarged.
8. An ovule, much magnified.
9. An open fruit, enlarged.
10. Cross section of a fruit, enlarged.
11. A seed, enlarged.
12. Vertical section of a seed, enlarged.
13. An embryo, much magnified.
14. A leafy branch, natural size.
15. The base of a leaf with stipules, natural size.
16. A branchlet showing flowers and leaf-bud in winter.
17. A cluster of flower-buds with bracts and bractlets, enlarged.

Silva of North America.

C.E.Faxon del.

HAMAMELIS VIRGINIANA, L

Picart fr. sc.

A.Riocreux dirext.

Imp.R.Taneur, Paris

LIQUIDAMBAR.

Flowers usually unisexual, capitate, apetalous; stamens indefinite in globular heads; ovary 2-celled; ovules indefinite, suspended. Fruit a spherical head of woody carpels consolidated by their bases. Leaves alternate, palmately lobed, stipulate, deciduous.

Liquidambar, Linnæus, *Gen.* ed. 2, 463 (1742). — Adanson, *Fam. Pl.* ii. 376. — A. L. de Jussieu, *Gen.* 410. — Endlicher, *Gen.* 289. — Meisner, *Gen.* 347. — Bentham & Hooker, *Gen.* i. 669. — Baillon, *Hist. Pl.* iii. 461 (excl. *Altingia*). — Engler & Prantl, *Pflanzenfam.* iii. pt. ii. 123.

Trees, with balsamic juices, scaly bark, terete often winged branchlets, scaly buds, and fibrous roots. Leaves plicate in vernation, alternate, palmately lobed, glandular-serrate, long-petiolate, deciduous; stipules lanceolate, acute, caducous. Flowers monœcious or occasionally perfect, in capitate heads surrounded by involucres of four deciduous bracts, the males in terminal racemes, the females in solitary long pedunculate heads from the axils of the upper leaves. Male flowers destitute of calyx and corolla; stamens indefinite, interspersed with minute scales; filaments filiform, shorter than the oblong obcordate introrse longitudinally dehiscent anthers attached by their bases. Female flowers surrounded by mammiformed or long-awned scales, the whole confluent into globular heads; calyx-limb short or nearly obsolete; stamens generally four, inserted on the summit of the obconic calyx; anthers minute, usually rudimentary or abortive, rarely fertile; ovary inserted in the bottom of the concave receptacle, partly inferior, two-celled, the carpels produced into an elongated subulate recurved persistent style stigmatic on its inner face; ovules indefinite, suspended from an axile placenta, anatropous; micropyle superior, raphe ventral. Fruit a globose multicapsular head armed with the hardened incurved styles; capsules free above, septicidally dehiscent at the apex, the epicarp thick and woody, the endocarp thin, corneous, lustrous on the inner surface, separable. Seeds usually solitary, or two by the abortion of many ovules, compressed, angulate; testa opaque, crustaceous, produced into a short membranaceous obovate wing rounded at the apex. Embryo surrounded by thin fleshy albumen; cotyledons oblong, flat, the radicle terete turned towards the lateral hilum.

Liquidambar is now confined to the eastern United States, to central and southern Mexico, Central America, the Orient, and middle and southeastern China; although in the Tertiary epoch the forests which clothed the western slopes of the Sierra Nevada in California possessed a Liquidambar,[1] and the immediate ancestor[2] of the existing American species inhabited Alaska, Greenland, and the mid-continental plateau of North America, and later was widely distributed in the Miocene of Europe, where have been found the traces of a second species[3] similar in the form of its leaves to the present representative of the genus in western Asia. Three species are distinguished in the genus as it is now usually limited: *Liquidambar Styraciflua* is American; *Liquidambar orientalis*[4] inhabits a few

[1] *Liquidambar Californicum*, Lesquereux, *Mem. Mus. Comp. Zoöl.* vi. pt. ii. 14 (*Fossil Plants of the Auriferous Gravel Deposit of the Sierra Nevada*) (1878). — Zittel, *Handb. Palæontolog.* ii. 624, f. 12.

[2] Lesquereux, *U. S. Geolog. Surv.* viii. 159, t. 32, f. 1 (*Contrib. Foss. Fl. Western Territories*, iii.). — Saporta, *Origine Paléontologique des Arbres*, 194. — Zittel, *l. c.* f. 1–7.

[3] *Liquidambar protensium*, Unger, *Icon. Foss.* 44, t. 20, f. 27 (1852). — Saporta, *l. c.* 195.

[4] Miller, *Dict.* ed. 8, No. 2 (1768). — Hooker, *Icon.* xi. 13, t. 1019. — De Candolle, *Prodr.* xvi. pt. ii. 158. — Boissier, *Fl. Orient.* ii. 819. — Koch, *Dendr.* ii. 465.

Liquidambar imberbe, Aiton, *Hort. Kew.* iii. 365 (1789).

The Oriental Liquidambar is described as a handsome tree attain-

provinces in southwestern Asia Minor; and *Liquidambar Formosana* is found in China and on the island of Formosa.[1]

All the species produce hard straight-grained handsome dark-colored wood and valuable balsamic exudations.[2]

ing the height of thirty or forty feet, and is said to form forests of considerable extent in the extreme southwestern part of Asia Minor. Introduced into France toward the middle of the eighteenth century by the French consul at Smyrna, it was first cultivated in Europe at the King's Garden in Marly (Duhamel, *Traité des Arbres*, i. 366. — *Nouveau Duhamel*, ii. 44. — Loudon, *Arb. Brit.* iv. 2053, f. 1963, 1964).

[1] Hance, *Ann. Sci. Nat.* sér. 5, v. 215 (1866); *Jour. Bot.* viii. 274. — Hooker, *Icon.* xi. 14, t. 1020. — Forbes & Hemsley, *Jour. Linn. Soc.* xxiii. 291.

Liquidambar acerifolia, Maximowicz, *Bull. Acad. Sci. St. Pétersbourg*, x. 486 (*Mél. Biol.* vi. 21) (not Unger) (1866).

Liquidambar Maximowiczii, Miquel, *Ann. Mus. Bot. Lugd. Bat.* iii. 200 (1867). — Franchet, *Pl. David.* i. 357.

Liquidambar species, Hemsley, *Jour. Bot.* xiv. 207 (1876).

The Chinese Liquidambar is a handsome tree thirty to forty feet in height, distinguished from the other species by its dull rather opaque leaves and by the long-awned scales which surround the female flowers and harden in the development of the fruit. From *Liquidambar Formosana*, and from an imperfectly known tree of central China, which is probably an undescribed species in this genus (Forbes & Hemsley, *l. c.* 290), the wood used in making tea-chests and the forms in which brick-tea is compressed is largely obtained.

In southern Japan *Liquidambar Formosana* is occasionally cultivated as an ornamental tree, and fine specimens exist in the Botanic Garden of the Imperial University in Tōkyō.

[2] From *Liquidambar orientalis* is derived liquid storax, an opaque grayish brown resin. The origin of this substance remained unknown until recent years, although the bark has been widely exported from Asia Minor, and in general use at least since the beginning of the Christian era, especially in India and China, where the largest part of the product is still consumed. The extraction of the resin is carried on by wandering tribes of Turcomans in the forests of southwestern Asia Minor. The process, as described by Flückiger & Hanbury, consists in the removal of the outer bark of the tree, which is not productive; the inner bark is then scraped off with a peculiar knife made for the purpose, and is stored in vats until a sufficient quantity is collected; it is then boiled with water in copper kettles, and the resin which now separates and rises to the surface is skimmed off. In order to obtain the residue which the first process has not separated, the boiled bark is put into hair bags, and subjected to pressure while hot water is poured over it. In this way are obtained a product of an inferior quality and the cakes of foliaceous fragrant bark known in European pharmacy as cortex thymiamatis. The resin is packed in barrels, or with water in goatskins, and shipped to Constantinople, Smyrna, and Alexandria, the largest part of the annual crop, which is estimated at from sixty to eighty thousand pounds, being sent by the way of the Red Sea to Bombay. In India and China gum storax appears to be chiefly used in perfumery, as a protection against insects, and in the temples as incense. It is said to be expectorant and stimulant, and to be valuable in the treatment of bronchial affections; it is praised as a remedy for diphtheria, and has been recommended as a cure for gonorrhœa; in Europe it is still used as an ingredient in some old-fashioned remedies (A. Richard, *Hist. Nat. Méd.* ed. 3, iii. 193. — Lindley, *Med. Fl.* 321. — Rosenthal, *Syn. Pl. Diaphor.* 203. — Hanbury, *Pharm. Jour.* xvi. 417, 461; *Bonplandia*, v. 114, t.; *Jour. de Pharm.* xxxi. 198. — Flückiger & Hanbury, *Pharmacographia*, 241. — Guibourt, *Hist. Drog.* ed. 7, ii. 305. — Spons, *Encyclopædia of the Industrial Arts, Manufactures, and Raw Commercial Products*, ii. 1682. — Balfour, *Encyclopædia of India*, ed. 3, ii. 721. — Baillon, *Traité Bot. Méd.* 770, f. 2401–2403. — *U. S. Dispens.* ed. 16, 1430).

The American species, *Liquidambar Styraciflua*, yields from natural fissures in the bark or by incision small quantities of balsamic resin, which is produced more freely in the southern states and in Mexico and Central America than in the north. It flows from the trees in the form of a semitransparent yellowish brown liquid with a balsamic odor and a bitter acrid taste, and upon exposure gradually hardens and turns to a darker color. The product of *Liquidambar Styraciflua*, known as liquidambar or copalm balm, is now considered to be identical in its properties with the liquid storax obtained from *Liquidambar orientalis*, and to be useful for the same purposes. Another product is obtained by boiling the young branches in water; the substance which rises to the surface is dark-colored and nearly opaque, but has the same properties as copalm balm. A syrup prepared from the bark of this tree has been employed with advantage in some parts of the country in the treatment of dysentery and catarrhal affections; the concrete juice is used as a chewing-gum to sweeten the breath, and sometimes as an ingredient in ointments. In the south the bark has been successfully used in camp-hospitals in the treatment of diarrhœa and dysentery (*Medical and Surgical History of the War of the Rebellion*, pt. ii., i. *Medical History*, 47); and it is now considered a useful and valuable mucilaginous astringent (Dale, *Pharmacologia*, 406. — Pomet, *Hist. Gen. Drog.* pt. i. 282. — Linnæus, *Mat. Med.* 152. — Le Page du Pratz, *Histoire de la Louisiane*, ii. 38, t. — Bergius, *Mat. Med.* ii. 798. — B. S. Barton, *Coll.* ed. 2, i. 16. — Hayne, *Arzn.* xi. t. 25. — Nees von Esenbeck, *Pl. Med.* t. 95. — A. Richard, *l. c.* 193. — Lindley, *l. c.* 322. — Pereira, *Elements Mat. Med.* ed. 4, ii. pt. i. 336. — Royle, *Mat. Med.* 562. — Griffith, *Med. Bot.* 581, f. 254. — Rosenthal, *l. c.* — Guibourt, *l. c.* 305, f. 445. — Spons, *l. c.* — Baillon, *l. c.* 1772, f. 2404. — Johnson, *Man. Med. Bot. N. Am.* 146, f. 128, 129. — Parke, Davis & Co., *Organic Mat. Med.* 176. — *U. S. Dispens.* ed. 16, 1843).

From *Liquidambar Formosana* a dry terebinthinous resin of agreeable fragrance is obtained, which is believed by Flückiger & Hanbury to be the *Styrax liquida folio minore* described by Ray as imported from Amoy (*Hist. Pl.* iii. Appx. 233). It is used by the Chinese, as is also the product of the allied *Altingia Chinensis*, as a stimulant, alterative, and anti-hæmorrhagic remedy, and in the treatment of wounds and sores (Flückiger & Hanbury, *l. c.* 246. — Smith, *Chinese Mat. Med.* 205. — Spons, *l. c.* 1683).

Corky excrescences, developed on the trunk and root-stalk of *Liquidambar Formosana* and known as pigs' tubers (chü-ling), from their resemblance to pigs' dung, are a popular remedy in China in the treatment of fevers and urinary disorders (Smith, *l. c.* 171).

In the United States Liquidambar is little injured by the attacks of insects,[1] and does not suffer seriously from fungal diseases.[2]

The generic name, from *liquidus* and the Arabic word *ambar*, adopted by Linnæus in allusion to the fragrant juices of the tree, was at first applied by Hernandez[3] to the American species or to some other balsamic Mexican tree.

[1] Liquidambar in the United States is nearly exempt from injuries inflicted by insects. There is no record of damage to the wood by borers. The most conspicuous of the foliage-eating insects found on the American species belong to the family *Bombyciдæ;* the large American silk-worms of the Luna, Cecropia, Polyphemus, and Promethea moths feed upon it, although rarely in sufficient numbers to cause serious injury. Liquidambar is sometimes also attacked by the Fall Web-worm, *Hyphantria cunea*, Drury; and in southern Kentucky during the summer months a Leaf-miner, *Phyllocnistis liquidambarisella*, Chambers, has been found making long winding linear mines in the upper surface of the leaves (*Cinn. Quart. Jour. Sci.* ii. 106).

[2] Nearly eighty species of fungi have already been noticed on Liquidambar in the United States, although few of them are peculiar to the tree or do it any particular harm. Among the species found only on Liquidambar the following may be mentioned: *Valsa Liquidambaris*, Curtis, *Seiridium Liquidambaris*, Berkeley & Curtis, *Septoria Liquidambaris*, Cooke & Ellis.

[3] *Nov. Pl. Hist.* lib. i. pt. ii. cap. 18 (Ximenes, Spanish ed. Mexico, 1615). — C. Bauhin, *Prodr.* 158; *Pinax*, 502.

LIQUIDAMBAR STYRACIFLUA.

Sweet Gum. Bilsted.

LEAVES deeply 5 to 7-lobed, lustrous.

Liquidambar Styraciflua, Linnæus, *Spec.* 999 (1753). — Miller, *Dict.* ed. 8, No. 1. — Kalm, *Travels*, English ed. ii. 21. — Moench, *Bäume Weiss.* 56; *Meth.* 340. — Marshall, *Arbust. Am.* 77. — Castiglioni, *Viag. negli Stati Uniti*, ii. 279. — Wangenheim, *Nordam. Holz.* 49, t. 16, f. 40. — Walter, *Fl. Car.* 237. — Lamarck, *Dict.* iii. 533. — Gærtner, *Fruct.* ii. 57, t. 90. — Willdenow, *Berl. Baumz.* 172; *Spec.* iv. 475; *Enum.* 985. — Borkhausen, *Handb. Forstbot.* i. 633. — Abbot, *Insects of Georgia*, i. t. 48. — Michaux, *Fl. Bor.-Am.* ii. 202. — Persoon, *Syn.* ii. 573. — Desfontaines, *Hist. Arb.* ii. 541. — Titford, *Hort. Bot. Am.* 97. — Schkuhr, *Handb.* iii. 275, t. 307. — *Nouveau Duhamel*, ii. 42, t. 10. — Michaux f. *Hist. Arb. Am.* iii. 194, t. 4. — Pursh, *Fl. Am. Sept.* ii. 635. — Rafinesque, *Fl. Ludovic.* 116. — Nuttall, *Gen.* ii. 219. — Elliott, *Sk.* ii. 621. — Poiret, *Lam. Dict. Ill.* iii. 367, t. 783. — Sprengel, *Syst.* iii. 864. — Audubon, *Birds*, t. 45. — Torrey, *Fl. N. Y.* ii. 217. — Spach, *Hist. Vég.* xi. 84. — Broomfield, *Lond. Jour. Bot.* vii. 144. — Schnizlein, *Icon.* t. 98, f. 5–21. — Chapman, *Fl.* 157. — Curtis, *Rep. Geolog. Surv. N. Car.* 1860, iii. 77. — De Candolle, *Prodr.* xvi. pt. ii. 157. — Hooker, *Icon.* xi. 13. — Koch, *Dendr.* ii. 464. — Baillon, *Hist. Pl.* iii. 397; *Dict. Bot.* iii. 262. — Le Maout & Decaisne, *Traité Gén. Bot.* 533, figs. — Ridgway, *Proc. U. S. Nat. Mus.* 1882, 67. — Lauche, *Deutsche Dendr.* ed. 2, 337, f. 129. — Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix. 86. — Watson & Coulter, *Gray's Man.* ed. 6, 180.

Liquidambar Styraciflua, var. **Mexicana**, Örsted, *Am. Cent.* xvi. t. 11 (1863).

Liquidambar macrophylla, Örsted, *Am. Cent.* xvi. t. 10 (1863). — Hemsley, *Bot. Biol. Am. Cent.* i. 400.

A tree, eighty to one hundred and forty feet in height, with a straight trunk four or five feet in diameter, and slender branches which, while the tree is young, form a symmetrical pyramidal head, and when it reaches old age a comparatively small oblong crown. The bark of the trunk on fully grown individuals varies from an inch to an inch and a half in thickness; it is dark brown tinged with red, and broken by deep fissures into broad ridges covered by short thick scales. The branchlets, which contain a large pith, are slightly many-angled, and covered, when they appear, with caducous rufous hairs; in their first winter they are light orange-color to reddish brown, with occasional minute dark lenticels, and large arcuate leaf-scars marked by the ends of three conspicuous clusters of fibro-vascular bundles; in their first season they develop corky wings, which on lateral branches appear on the upper side in three or four parallel ranks, and irregularly on all sides of vertical branches, increasing in width and thickness for many years, until they are sometimes two or three inches broad and an inch thick.[1] In their second year the branchlets become red-brown, gray, or dark brown. The winter-buds are acute, a quarter of an inch long, and covered with ovate acute minutely apiculate orange-brown scales rounded on the back, those of the inner rows being accrescent, slightly ciliate on the margins, tipped with red, and at maturity half an inch in length. The leaves are generally round in outline, truncate or slightly heart-shaped at the base, deeply five to seven-lobed, with acutely pointed divisions, and finely glandular-serrate with rounded appressed teeth; they are six to seven inches across, and are borne on slender petioles at first clothed near the base with rufous caducous hairs and five to seven inches in length; when they unfold they are pilose on the lower surface, but usually soon become glabrous, with the exception of large tufts of pale or rufous hairs which remain in the axils of the principal veins during the season; at maturity they are thin and rather membranaceous, bright green, smooth, and lustrous, with broad primary veins and finely reticulated veinlets; when bruised they exhale a pleasant resinous fragrance; and in the autumn they turn a deep crimson. The stipules are lanceolate, acute, entire,

[1] Emily L. Gregory, *Bot. Gazette*, xiii. 282.

glabrous, from one third to half an inch in length, and caducous. The flowers appear from March to the end of May, when the leaves are more than half grown, the males in terminal racemes two or three inches long and coated with rufous hairs, the females in a solitary head borne on a slender glabrous peduncle an inch to two inches in length and developed from the axil of one of the upper leaves. The heads of male flowers, which are stalked towards the base of the raceme and nearly sessile above, are a quarter of an inch across and surrounded by ovate acute deciduous hairy bracts much larger than the lanceolate acute bracts of the female inflorescence, which is half an inch across and conspicuous from the broad stigmatic surfaces of the recurved and contorted styles. The fruit is an inch to an inch and a half in diameter, and hangs on the branches during the winter, the carpels, which rarely contain fertile seeds but are generally filled with abortive ovules in various stages of development, opening in the autumn. The seed is half an inch long and rather longer than its wing, with a light brown coat conspicuously marked with oblong resin-ducts.

Liquidambar Styraciflua is distributed from Fairfield County, Connecticut, to southeastern Missouri, southward to Cape Canaveral and the shores of Tampa Bay, Florida, and through Arkansas and the Indian Territory to the valley of the Trinity River in Texas; it reappears on the mountains of central and southern Mexico[1] and ranges southward to the highlands of Guatemala.[2] In some parts of the United States, especially in the maritime region of the southern Atlantic states and in the basin of the lower Mississippi River, the Sweet Gum is one of the most common trees in the forests of low rich river-bottom lands which are usually inundated every year; in such situations, growing with the Cotton Gum, the Chestnut White Oak, the Willow Oak, the Red Maple, the Black Gum, and the Water Ash, it develops tall straight trunks free from branches to a height of seventy or eighty feet above the ground.[3] In the northern and middle states it is found on the borders of swamps and in low wet swales, where in company with the Red Maple, the Swamp White Oak, the Tupelo, the White Ash, and the Red Ash, it often grows in great numbers; occasionally the Sweet Gum appears on drier and more elevated ground, where it remains small; and in the north it rarely grows more than sixty or seventy feet tall or produces a trunk more than two feet in diameter.

The wood of *Liquidambar Styraciflua* is heavy, hard, straight, and close-grained, although not very strong; it is bright brown tinged with red, with thin almost white sapwood composed of sixty or seventy layers of annual growth. The specific gravity of the absolutely dry wood is 0.5910, a cubic foot weighing 36.83 pounds. The wood of the Sweet Gum is smooth and satiny and can be made to take a beautiful polish; it is difficult to season and warps and shrinks badly in drying,[4] but in spite of this serious defect it is now used in large quantities, especially in the western states, in the outside finish of houses, in cabinet-making, for street-pavements, cheap dishes, and fruit-boxes.

The leaves contain tannin, and have been recommended as a substitute for Oak-bark for tanning leather.[5]

In 1615 the first account of this tree from the pen of the Spanish naturalist Hernandez was published in the City of Mexico,[6] and the resin, which resembled the liquid storax of the east, soon

[1] Humboldt, Bonpland & Kunth, *Nov. Gen. et Spec.* vii. 273. — Kunth, *Syn. Pl. Æquin.* iv. 266. — Seemann, *Bot. Voy. Herald*, 346. — Hemsley, *Bot. Biol. Am. Cent.* i. 400.

[2] Donnell Smith, *Pl. Guatemal.* No. 1855.

[3] Sargent, *Garden and Forest*, ii. 232, f.

[4] "Le Copalm réunit deux grandes qualités; l'une, d'être extrêmement commun, l'autre de donner un baume dont les vertus sont infinies . . . Son bois est si tendre & si souple, qu'en l'abbattant il sort de son cœur des baguettes de cinq à six pieds de longeur. On ne peut l'employer à aucuns ouvrages à cause qu'il travaille sans cesse, & se tourmente de telle sorte, qu'il se met dans des figures surprenantes que l'on ne voit dans aucun bois du monde. On n'ose même le brûler parce que son odeur est trop forte, quoiqu'elle soit agréable lorsque l'on n'en brûle qu'une petite quantité." (Le Page du Pratz, *Histoire de la Louisiane*, ii. 27, t.)

[5] Porcher, *Resources of Southern Fields and Forests*, 345.

[6] *Del arbol de Liquidambar, que los naturales llaman "Xochiocotzotl," "Quauhxihuitl,"* Francisco Hernandez, *Nov. Pl. Hist.* lib. i. pt. ii. cap. 18 (Ximenes, Spanish ed. Mexico, 1615).

Styrax Aceris folio, Parkinson, *Theatr.* 1529.

Acer Virginianum odoratum, Hermann, *Cat. Hort. Lugd. Bat.* 641. — Boerhaave, *Ind. Alt.* ii. 234.

Styrax arbor Virginiana Aceris folio, potius Platanus Virginiana Styracem fundens, Ray, *Hist. Pl.* ii. 1799. — Commelyn, *Hort.* i. 191, t. 98.

Liquid-ambari arbor s. Styraciflua Aceris folio, fructu tribuloide

attracted the attention of European pharmacists.[1] It was introduced from Virginia into England, and was cultivated before 1688 by Bishop Compton in his garden at Fulham.[2]

As an ornament for parks and roadsides in the middle and southern states, few trees are more valuable than the Sweet Gum.[3] It grows rapidly and is not particular about soil; its habit, although rather regular before it reaches maturity, adapts it to formal planting; the leaves are unsurpassed in beauty of form, in lustre, or in the brilliancy of their autumnal tints; and in winter its broadly winged branches make it a curious and interesting object.

(*i. e.*) *pericarpio orbiculari, ex quamplurimis apicibus coagmentato semen recondens*, Plukenet, *Phyt.* t. 42, f. 6; *Alm. Bot.* 224. — Catesby, *Nat. Hist. Car.* ii. 65, t. 65.

Liquidambar, Linnæus, *Hort. Cliff.* 486; *Hort. Ups.* 287. — Clayton, *Fl. Virgin.* 190. — Royen, *Fl. Leyd. Prodr.* 534.

Liquidambari Arbor, Blackwell, *Coll. Stirp.* t. 485.

Il Xochiocotzotl, volgarmente appellato Liquidambar, è lo storace liquido dei Messicani, Clavigero, *Storia Antica del Messico*, i. 64.

Liquidambar Styraciflua; Aceris folio, Romans, *Nat. Hist. Florida*, 20.

[1] J. Bauhin, *Hist. Pl.* i. lib. ix. 323. — Parkinson, *Theatr.* 1590.

[2] Ray, *Hist. Pl.* ii. 1681. — Aiton, *Hort. Kew.* iii. 365. — Loudon, *Arb. Brit.* iv. 2049, f. 1961.

[3] In some parts of the country *Liquidambar Styraciflua* is also known as Star-leaved Gum, Liquidamber, and Red Gum.

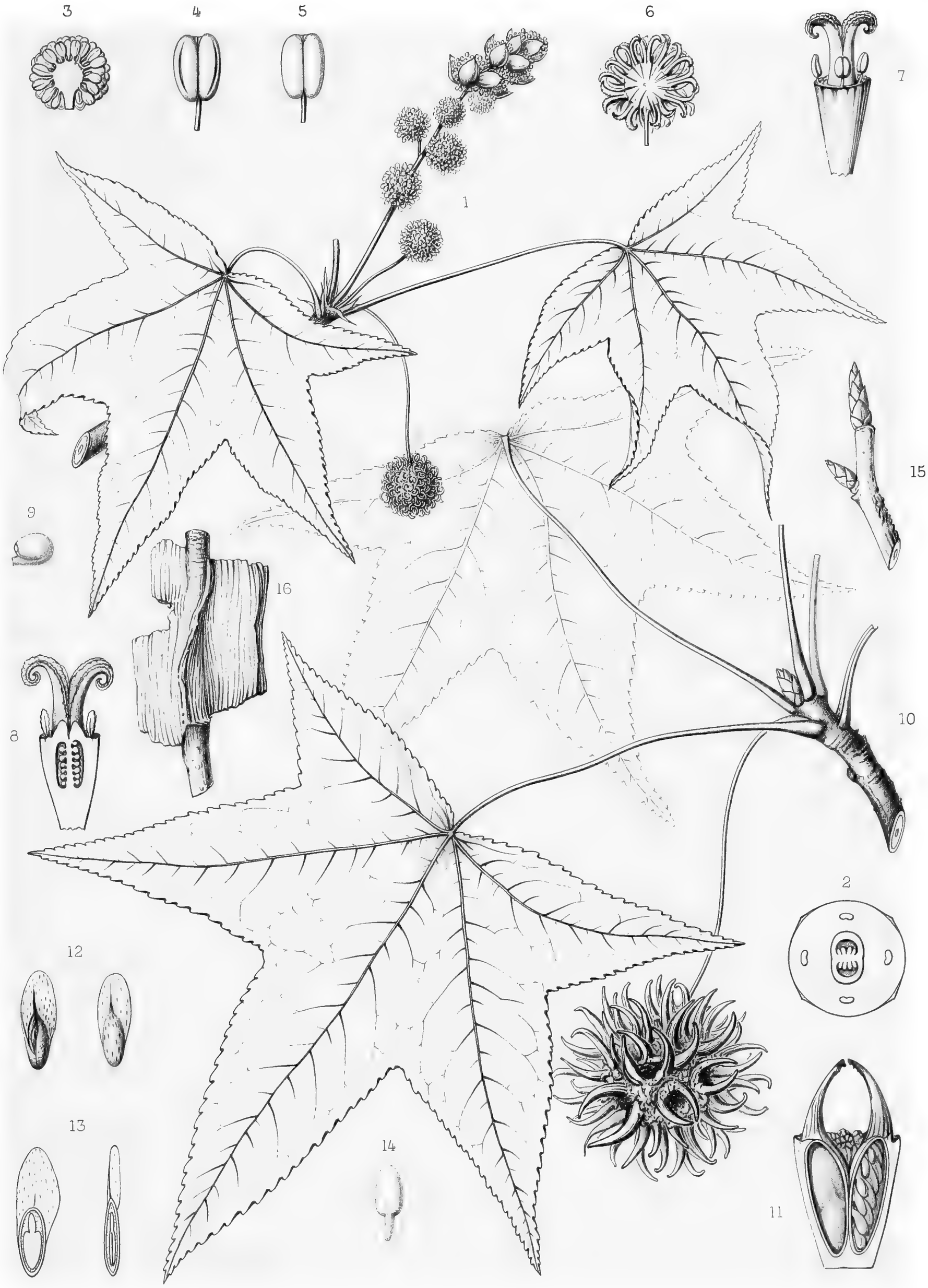
EXPLANATION OF THE PLATE.

Plate CXCIX. Liquidambar Styraciflua.

1. A flowering branch, natural size.
2. Diagram of a pistillate flower.
3. Vertical section of a head of stamens, natural size.

4 and 5. Front and rear views of a stamen, enlarged.

6. Vertical section of a head of pistillate flowers, natural size.
7. A pistillate flower, enlarged.
8. Vertical section of a pistillate flower, enlarged.
9. An ovule, much magnified.
10. A fruiting branch, natural size.
11. Vertical section of a capsule showing in one cell a perfect seed and in the other a mass of undeveloped ovules, enlarged.
12. A seed, natural size.
13. Vertical sections of a seed, enlarged.
14. An embryo, enlarged.
15. A winter-bud, natural size.
16. Part of a young branch with wings.



C.E. Faxon del. Picart sc.

LIQUIDAMBAR STYRACIFLUA, L.

A. Riocreux direx.t Imp. R. Taneur, Paris.

RHIZOPHORA.

FLOWERS perfect; calyx 4-parted, the lobes valvate in æstivation; petals 4, induplicate in æstivation; stamens 8 to 12; ovary partly inferior, 2-celled; ovules 2 in each cell, suspended. Fruit a 1-celled, 1-seeded berry, perforated at the apex by the germinating embryo. Leaves opposite, ovate or elliptical, entire, stipulate, persistent.

Rhizophora, Linnæus, *Gen.* 137 (1737). — A. L. de Jussieu, *Gen.* 213. — Meisner, *Gen.* 119. — Endlicher, *Gen.* 1185. — Bentham & Hooker, *Gen.* i. 678. — Baillon, *Hist. Pl.* vi. 299.

Mangle, Adanson, *Fam. Pl.* ii. 445 (1763).

Trees, with stout terete pithy branchlets, thick astringent bark, and adventitious fleshy roots. Leaves opposite, ovate or elliptical, entire, thick and coriaceous, glabrous, petiolate, persistent; stipules elongated, acuminate, interpetiolar, infolding the bud, caducous. Flower-clusters pedunculate, axillary, dichotomously or trichotomously branched, the base of the branches surrounded by an involucre of two ovate three-lobed persistent bracts, or one-flowered. Flowers yellow or creamy white, sessile or pedicellate, bibracteolate, the bractlets united into an involucral cup. Calyx four-lobed, the lobes acute, coriaceous, ribbed on the inner surface and thickened on the margins, two or three times longer than the turbinate-globose tube, reflexed at maturity, persistent. Petals alternate with and longer than the lobes of the calyx, inserted on a fleshy disk-like ring in the mouth of the calyx-tube, involute on the margins and coated on the inner surface with long pale hairs, or flat and naked, caducous. Stamens[1] eight, four episepalous and four slightly longer, epipetalous, or eleven or twelve; filaments short or wanting; anthers attached at the base, introrse, triangular in section, elongated, connivent, areolate, their membranous coat splitting by two longitudinal slits united near the apex and disclosing numerous spherical cavities covering their inner face and filled with pollen grains.[2] Ovary partly inferior, conical, two-celled, contracted into two subulate spreading styles stigmatic at the apex; ovules two in each cell, suspended from its apex, collateral, anatropous; raphe ventral, micropyle superior. Fruit a conical coriaceous berry surrounded by the reflexed persistent calyx-lobes. Seed usually solitary by abortion, suspended, and germinating in the fruit before falling; the apex surrounded by a thin albuminous micropylar cup-like aril,[3] testa thick and fleshy. Embryo at first surrounded by a thin layer of albumen; cotyledons conferruminate, dark purple; radicle elongated, clavate, perforating in its development the apex of the fruit, and when fully grown separating from the narrow exserted woody tube inclosing the plumule and developed from the cotyledons after the ripening of the fruit.[4]

Rhizophora is widely and generally distributed on the shores of tidal marshes in the tropical regions of the two worlds. Three species are distinguished: one is American; a second, *Rhizophora*

[1] Griffith, *Trans. Med. & Phys. Soc. Calc.* viii. 1. — Baillon, *Bull. Soc. Linn. Paris*, i. 58; *Hist. Pl.* vi. 286.

[2] By the splitting of the membranous coat of the anther a triangular valve is formed which is attached by the base and in opening falls forward, while the two lateral wings on the open anther are made by the spreading back of the membrane on the outer sides of the slits.

[3] Tulasne, *Ann. Sci. Nat.* sér. 4, vi. 110. — Warming, *Engler Bot. Jahrb.* iv. 530.

[4] Petit-Thouars, *Desvaux Jour. Bot.* ii. 32. — Griffith, *Notul.* iv. 662.

conjugata,[1] is Indian; and the third, *Rhizophora mucronata*,[2] is found on the west and east coasts of Africa, on Madagascar, in southern Asia from Arabia to the Malay peninsula, in the East Indies, New Guinea, Australia, and the South Sea Islands.

Rhizophora possesses astringent properties; the bark of all the species has been used in tanning leather, in dyeing, and as a febrifuge;[3] and the wood is hard, durable, and dark-colored. Rhizophora is especially adapted to maintain itself on low muddy tidal shores, and plays an important part in protecting and in extending them into the ocean; this it is able to do by the aerial germination of the seeds and by the power to develop roots from the trunks and branches. Of these some spring from the stems at a considerable distance above the ground and, arching outward, descend into the water and fix themselves in the mud beneath, while other roots growing down from the branches enter the ground and gradually thicken into stems, the whole forming a barrier which prevents the mud washed up by rising tides from being swept away again, and gradually consolidates it. The structure and character of the seed are wonderfully adapted to aid in this extension of the land into the water. The aerial germination protects it from the salt water, into which, without such a provision, it would fall, probably to be washed away or destroyed. The radicle, when fully grown and ready to put forth roots and leaves, is often ten or twelve inches long; the root-end is thicker and heavier than the other, so that when it detaches itself from the cotyledons and falls, the heavy end sticks into the mud; here being kept in position, it puts forth roots, while the plumule at the other end is held up above the surface of the shallow water and is thus enabled to unfold its leaves.

The generic name, from ῥίζα and φέρειν, used by early authors to designate various climbing plants with thickened roots, like Dioscorea,[4] was adopted for the Mangrove by Linnæus, who discarded the earlier Mangles of Plumier.[5]

[1] Linnæus, *Spec.* 443 (1753). — De Candolle, *Prodr.* iii. 33. — Walker-Arnott, *Ann. Nat. Hist.* i. 363. — Blume, *Mus. Bot. Lugd. Bat.* i. 134. — Brandis, *Forest Fl. Brit. Ind.* 218. — Hooker f. *Fl. Brit. Ind.* ii. 436.

Rhizophora candelaria, De Candolle, *l. c.* 32 (1828).

Rhizophora apiculata, Blume, *Enum. Pl. Jav.* 91 (1827). — Wight, *Ill.* i. 209. — Kurz, *Forest Fl. Brit. Burm.* i. 447.

Rhizophora Mangle, Blanco, *Fl. Filip.* 397 (not Linnæus) (1837).

[2] Poiret, *Lam. Dict.* vi. 189 (1804). — Lamarck, *Ill.* ii. 517, t. 396, f. 2. — De Candolle, *l. c.* — Decaisne, *Ann. Sci. Nat.* sér. 2, iv. 75. — Wight, *l. c.; Icon.* t. 238. — Walker-Arnott, *l. c.* 362. — Blume, *Mus. Bot. Ludg. Bat.* i. 132. — Tulasne, *Ann. Sci. Nat.* sér. 4, vi. 109. — Gray, *Bot. Wilkes Explor. Exped.* i. 613. — Harvey & Sonder, *Fl. Cap.* ii. 513. — Bentham, *Fl. Austral.* ii. 493. — Oliver, *Fl. Trop. Afr.* ii. 407. — Brandis, *l. c.* 217. — Kurz, *l. c.* — Hooker f. *l. c.* — Baker, *Fl. Maur. & Seych.* 109.

Rhizophora Mangle, Roxburgh, *Fl. Ind.* ii. 459 (not Linnæus) (1824). — Blume, *Enum. Pl. Jav.* 91.

Rhizophora macrorrhiza, Griffith, *Trans. Med. & Phys. Soc. Calc.* viii. 8 (1836).

Rhizophora candelaria, Wight & Walker-Arnott, *Prodr. Fl. Ind.* 310 (not de Candolle) (1834).

[3] Howison, *Trans. Soc. of Arts*, xxii. 201. — Hamilton, *Pharm. Jour.* vi. 11. — Baillon, *Hist. Pl.* vi. 298. — Procter, *Text Book of Tanning*, 55. — Trimble, *Contrib. Bot. Lab. Univ. Penn.* i. 50.

[4] Hermann, *Parad. Bat.* 217.

[5] *Nov. Pl. Am. Gen.* 13.

RHIZOPHORA MANGLE.

Mangrove.

LEAVES oval or elliptical, rounded at the apex.

Rhizophora Mangle, Linnæus, *Spec.* 443 (1753). — Gærtner, *Fruct.* i. 212, t. 45, f. 1. — Lamarck, *Ill.* ii. 517, t. 396, f. 1. — Willdenow, *Spec.* ii. 843. — Poiret, *Lam. Dict.* vi. 188. — Persoon, *Syn.* ii. 2. — Turpin, *Dict. Sci. Nat.* xlv. 386, t. 109. — De Candolle, *Prodr.* iii. 32. — Petit-Thouars, *Desvaux Jour. Bot.* ii. 27, t. 11. — Spach, *Hist. Vég.* iv. 332, t. 34. — Torrey & Gray, *Fl. N. Am.* i. 484. — Wight, *Ill.* i. 209. — Walker-Arnott, *Ann. Nat. Hist.* i. 361. — Walpers, *Rep.* ii. 70. — Blume, *Mus. Bot. Lugd. Bat.* i. 132. — Schnizlein, *Icon.* t. 263, f. 1–7, 21–29. — Chapman, *Fl.* 135. — Le Maout & Decaisne, *Traité Gén. Bot.* English ed. 419. — Warming, *Bot. Notiser*, 1877, 14, t. 1; *Engler Bot. Jahrb.* iv. 519, t. 7–10. — Eggers, *Videnskab. Medd. fra. nat. For. Kjobenh.* 1877, 177. — Baillon, *Hist. Pl.* vi. 284, f. 253–259. — Karsten, *Mangrove-Vegetation*, t. iv. f. 3, 6, 7, 8.

Rhizophora racemosa, Meyer, *Prim. Fl. Esseq.* 185 (1818). — De Candolle, *Prodr.* iii. 32. — Hooker f. & Bentham, *Hooker Niger Fl.* 341.

Rhizophora Mangle, *a.* Walker-Arnott, *Ann. Nat. Hist.* i. 361 (1838).

Rhizophora Americana, Nuttall, *Sylva*, i. 95, t. 24 (1842).

Rhizophora Mangle, var. **racemosa**, Eichler, *Martius Fl. Brasil.* xii. pt. ii. 427 (1872).

A round-topped bushy tree, with spreading branches, usually fifteen to twenty feet in height, forming almost impenetrable thickets with its numerous aerial roots; or occasionally seventy or eighty feet high, with a tall straight stem clear of branches for more than half its length, and a narrow head. The bark of the trunk is from one third to one half an inch thick and gray faintly tinged with red, the surface irregularly fissured and broken into thin appressed scales; that of young trunks and principal branches is smooth and rather light reddish brown. The branchlets are stout, glabrous, and dark red-brown, becoming lighter in their second year, when they are conspicuously marked with large oval slightly elevated leaf-scars. The leaves, which remain on the branches during one or two years, are oval or elliptical, rounded at the apex, and gradually contracted at the base into stout petioles; they are three and a half to five inches long, an inch to two and a half inches broad, with petioles which vary from half an inch to an inch and a half in length, dark green and very lustrous on the upper surface and paler below, with slightly thickened margins, broad midribs, and reticulated veinlets. The stipules are lanceolate, acute, and an inch and a half long, and fall as the leaf unfolds. The flowers, which are produced throughout the year from the axils of young leaves, are nearly sessile on stout two or three-branched peduncles an inch and a half to two inches in length; they are an inch across when expanded, the pale yellow involute petals being coated on the inner surface with long pale hairs which cover the eight stamens. The fruit is an inch long, rusty brown, and slightly roughened with minute bosses; from its apex, after the germination of the seed, the hard woody thick-walled tube developed from the cotyledons protrudes from one half to two thirds of an inch, covering the plumule and holding the dark brown radicle which is marked with occasional orange-colored lenticular dots, and which when fully grown is ten or twelve inches long and, near the apex, a quarter to one third of an inch thick.

In the United States *Rhizophora Mangle* inhabits the shores of Florida from Mosquito Inlet on the east coast and Cedar Keys on the west to the southern islands, the delta of the Mississippi River, and the coast of Texas; it occurs on Bermuda[1] and the Bahama Islands, in the Antilles,[2] on the east

[1] Lefroy, *Bull. U. S. Nat. Mus.* No. 25, 74 (*Bot. Bermuda*).

[2] Jacquin, *Stirp. Am.* 141, t. 89; *Hist. Select. Stirp. Am.* 70, t. 132. — Lunan, *Hort. Jam.* i. 487. — Descourtilz, *Fl. Méd. Antilles*, i. 45, t. 10. — A. Richard, *Fl. Cub.* i. 251. — Grisebach, *Fl. Brit. W. Ind.* 274. — Eggers, *Bull. U. S. Nat. Mus.* No. 13, 54 (*Fl. St. Croix and the Virgin Islands*).

and west coasts of Mexico,[1] in Lower California,[2] and the Galapagos Islands,[3] and from Central America extends along the north and east coasts of South America to the limit of the tropics;[4] by many authorities it has been thought to inhabit also the west coast of Africa.[5] In the United States the Mangrove is most abundant on the Florida peninsula south of latitude 29°, where it borders the coast with wide thickets, ascending the rivers for many miles, especially those flowing from the everglades, and entirely covers some of the small keys. On Cape Sable and on the shores of Bay Biscayne it sometimes grows at a little distance from the immediate coast, and on ground which is not submerged by overflowing tides; in such situations it attains its greatest size in the United States and makes tall shapely trees with straight trunks developing few aerial roots, and in general appearance is entirely unlike the low bushy widespreading shore tree.[6]

The wood of *Rhizophora Mangle* is exceedingly heavy, hard, close-grained, and strong. The surface is satiny and can be made to receive a beautiful polish; it is dark reddish brown streaked with lighter brown, with pale sapwood composed of forty or fifty layers of annual growth,[7] and contains numerous thin medullary rays. The specific gravity of the absolutely dry wood is 1.1617, a cubic foot weighing 72.40 pounds. On the Florida keys it is used for fuel and for wharf-piles, for which its strength and immunity from attacks of the teredo make it valuable.

The strange and peculiar mode of growth of the Mangrove-tree and the shell-fish which clustered on its stems attracted the attention of some of the earliest travelers who landed on the shores of the New World, and it is mentioned in many of their narratives.[8] Its presence in the United States

[1] Kunth, *Syn. Pl. Æquin.* iii. 86. — Hooker & Walker-Arnott, *Bot. Voy. Beechey*, 290. — Hemsley, *Bot. Biol. Am. Cent.* i. 402.

[2] Bentham, *Bot. Voy. Sulphur*, 14. — Brandegee, *Proc. Cal. Acad.* ser. 2, ii. 155 (*Pl. Baja Cal.*); iii. 136.

[3] Hooker f. *Trans. Linn. Soc.* xx. 225. — Andersson, *Stockh. Acad. Handl.* 1853, 108 (*Om Galapagos-Öarnes Veg.*).

[4] Vellozo, *Fl. Flum.* v. t. 1. — Eichler, *Martius Fl. Brasil.* xii. pt. ii. 426, t. 90. — Sagot, *Ann. Sci. Nat.* sér. 6, xv. 314.

[5] Hooker f. & Bentham, *Hooker Niger Fl.* 341. — A. De Candolle, *Géographie Botanique*, ii. 772. — Oliver, *Fl. Trop. Afr.* ii. 408.

[6] *Garden and Forest*, vi. 97, figs. 17, 18. — *Contrib. Bot. Lab. Univ. Penn.* i. t. 7.

[7] The trunks of *Rhizophora Mangle* after the first twenty or thirty years increase in diameter slowly. A specimen of the trunk of a Florida tree in the Jesup Collection of North American Woods in the American Museum of Natural History in New York, which is fifteen inches in diameter, has one hundred and forty-five layers of annual growth.

[8] "Mangle es un árbol de los mejores que en estas partes hay, y es comun en estas islas é Tierra-Firme." (Oviedo, *Hist. Nat. Gen. Ind.* lib. ix. cap. 6.)

"Store of oisters (grew) upon the branches of the trees, and were very salt and well tasted. All their oisters grow upon those boughs and spraies, and not on the ground: the like is commonly seen in other places of the West Indies, and elsewhere." (Walter Raleigh, *Discoverie of the Large, Rich & Beautiful Empire of Guiana*, Hakluyt, *Voyages*, ed. Evans, iv. 120.)

"Shrimps, Lobsters, and Oysters, which hang upon the branches of Trees." (Harcourt, *Relation of a Voyage to Guiana. Purchas his Pilgrimes*, iv. 1275.)

"The *Mangue* Trees are like the Swallowes, or *Willowes* of *Europe*, there is so great quantitie of them in the armes or creeks that the Sea maketh within the Land, that many leagues of the Land is of these Trees, that are watered with the tides. . . . A certaine kind of them doe cast certaine twigs from the top of their length some times as long as a Launce, till they come to the water, and then they cast many branches and rootes, and these branches remaine fast in the earth." (*A Treatise of Brasil, written by a Portugall which had long lived there. Purchas his Pilgrimes*, iv. 1316.)

De Mangle, Nieremberg, *Hist. Nat.* 313.

"*Marinis arboribus annumerant Manguas, quia magno numero juxta littora & Oceani recessus reperiuntur.*" (Jan de Laet, *Nov. Orb.* 575.)

Mangue Guaparaiba dicta, Piso, *Hist. Nat. Bras.* lib. iv. cap. 87.

Mangle Pyri foliis cum siliquis longis Ficui Indicæ affinis, J. Bauhin, *Hist. Pl.* i. lib. xii. 415. — Ray, *Hist. Pl.* ii. 1772. — Sloane, *Cat. Pl. Jam.* 155; *Nat. Hist. Jam.* ii. 63.

Du Paretuvier, Rochefort, *Histoire Naturelle et Morale des Isles Antilles*, 100, t.

"The Mangrave is a tree of such note, as she must not be forgotten; for, though she be not of the tall and lusty sort of trees, yet, she is of great extent; for there drops from her limbs a kinde of Gum, which hangs together one drop after another, till it touch the ground, and then takes root, and makes an addition to the tree. So that if all these may be said to be one and the same tree, we may say that a Mangrave tree may very well hide a troop of Horse. The bark of this tree being well ordered, will make very strong roaps, and the Indians make it as fine as flax, and spin it into fine thred whereof they make Hamocks, and divers other things they wear: and I have heard the linnen they wear is made of this bark, as also their chaires and stooles." (Richard Ligon, *A true and exact History of the Island of Barbados*, 72.)

Lignum Mangles, quod ferrum duritie æquat, Jonston, *Dendrographia*, 425.

Gvapereiba Lusitanis Mangue vereadeiro, Jonston, *Dendrographia*, 464.

Mangle arbor Pyrifolia, Plukenet, *Phyt.* t. 204, f. 3; *Alm. Bot.* 241.

Candela Americana, foliis Laurinis, flore tetrapetalo luteo, fructu angustiore, Catesby, *Nat. Hist. Car.* ii. 63, t. 63.

"And nothing of this kind could be more surprising to Europeans, than to see the Shores shaded with a kind of Fig-trees,

appears to have been first recorded in the *Histoire de la Louisiane* by Le Page du Pratz,[1] published in Paris in 1755.[2]

different from all other Trees in the manner of their growth; for from their branches hang innumerable small filaments growing downwards, till they touch the Earth, and then take Root." (Griffith Hughes, *Nat. Hist. Barbados*, 2.)

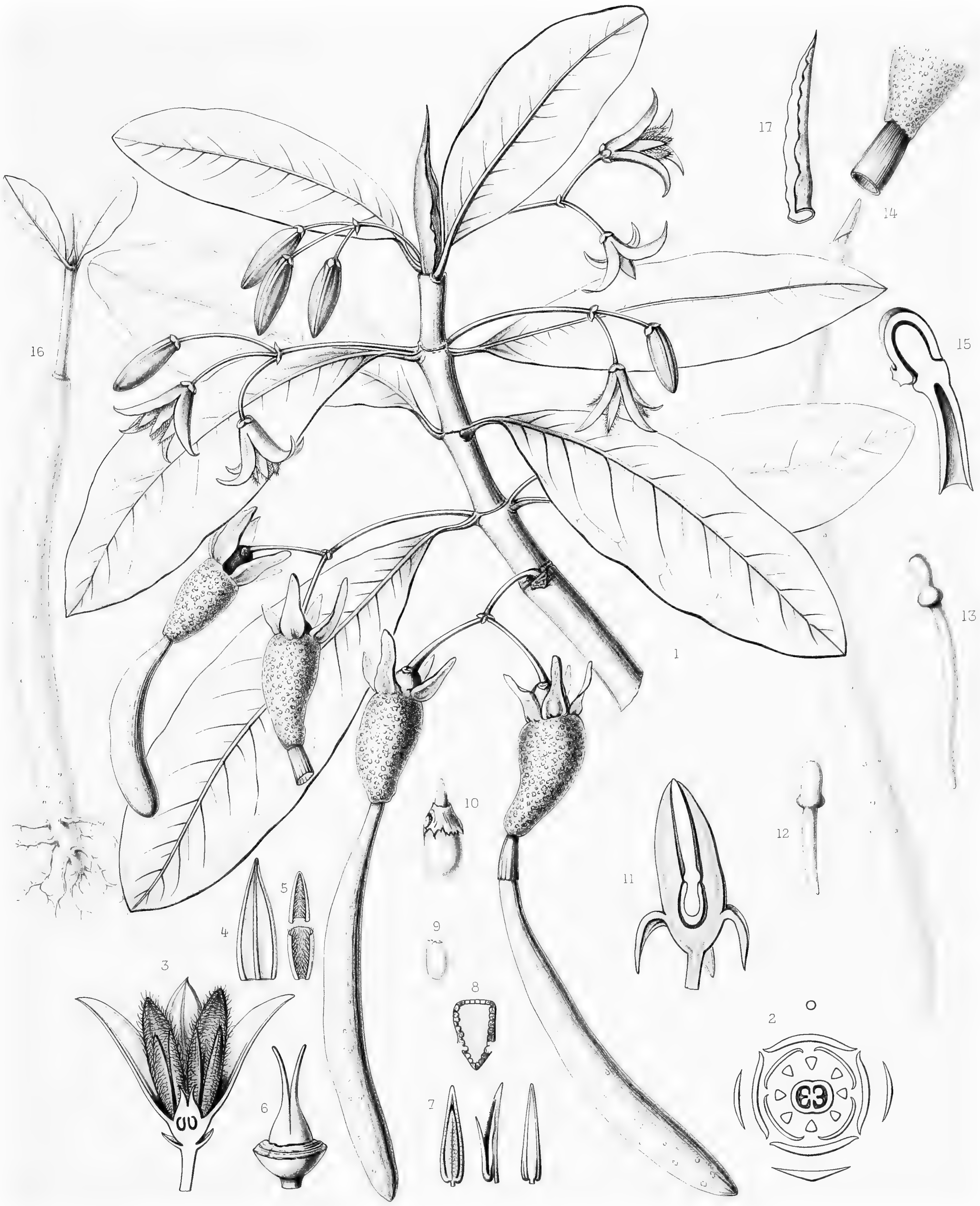
[1] Le Page du Pratz, a native of Holland, having served in Germany with the French army through several campaigns, emigrated to Louisiana in 1718 to take possession of a grant of land in the neighborhood of New Orleans which he had received from the French government. Later he established himself at Natchez and subsequently explored portions of the country west of the Mississippi River now included in the states of Arkansas, Missouri, and Texas. He returned to France in 1734 and twenty-eight years later published his *Histoire de la Louisiane*, in which are described the topography and natural history of the regions visited by the author and the habits of the Indians. Three chapters and a number of illustrations are devoted to the trees of Louisiana, which he appears to have studied with special care. He died in 1775.

[2] "Le Manglier est très-commun dans toute l'Amérique; il croît à la Louisiane dans le voisinage de la Mer sur le bord des eaux mortes. Il est plus nuisible qu'utile, en ce qu'il veut de la bonne terre, qu'il en occupe beaucoup, & que ses racines qui s'étendent dans l'eau empêchent l'abordage à ceux qui navigent, & donnent une retraite sûre aux Poissons contre les travaux & l'adresse des Pêcheurs." (*Histoire de la Louisiane*, ii. 41.)

EXPLANATION OF THE PLATE.

Plate CC. Rhizophora Mangle.

1. A flowering and fruiting branch, natural size.
2. Diagram of a flower.
3. Vertical section of a flower, enlarged.
4. A sepal, front view, enlarged.
5. A petal cut transversely, front view, enlarged.
6. A pistil, enlarged.
7. Front, side, and rear views of a stamen, enlarged.
8. Cross section of an anther, enlarged.
9. An ovule, much magnified.
10. A seed germinating, showing its ariloid growth, enlarged.
11. Vertical section of a fruit, slightly enlarged.
12. An embryo, enlarged.
13. An embryo partly developed, enlarged.
14. A fruit, the radicle detached, showing the plumule, natural size.
15. Vertical section of a seed, showing the tube developed from the cotyledons after the detachment of the radicle, enlarged.
16. A seedling plant, natural size.
17. A stipule, natural size.



C.E. Faxon del

Picart sc.

RHIZOPHORA MANGLE, L.

A. Riocreux direx.t

Imp. R. Taneur, Paris.

TERMINALIA.

FLOWERS perfect or polygamo-diœcious; calyx 5-toothed, the teeth valvate in æstivation; petals 0; stamens 10, in two series; ovary inferior, 1-celled; ovules 2 or rarely 3, suspended. Fruit drupaceous, 1-seeded. Leaves alternate or occasionally opposite, destitute of stipules.

Terminalia, Bentham & Hooker, *Gen.* i. 685 (1865). — Baillon, *Hist. Pl.* vi. 280 (excl. *Conocarpus*, *Ramatuella*, *Anogeissus*, and *Buchenavia*).
Bucida, Linnæus, *Syst.* ed. 10, 1025 (1759). — Adanson, *Fam. Pl.* ii. 80. — A. L. de Jussieu, *Gen.* 75. — Meisner, *Gen.* 110. — Endlicher, *Gen.* 1180.
Adamaram, Adanson, *Fam. Pl.* ii. 445 (1763).
Terminalia, Linnæus, *Mant.* 21 (1767). — A. L. de Jussieu, *Gen.* 76. — Meisner, *Gen.* 110. — Endlicher, *Gen.* 1180.
Tanibouca, Aublet, *Pl. Guian.* i. 448, t. 178 (1775). — A. L. de Jussieu, *Gen.* 76.
Pamea, Aublet, *Pl. Guian.* ii. 946, t. 359 (1775). — A. L. de Jussieu, *Gen.* 76.
Kniphofia, Scopoli, *Introduct.* 327 (1777).
Chuncoa, A. L. de Jussieu, *Gen.* 76 (1789).
Badamia, Gærtner, *Fruct.* ii. 90, t. 97, f. 1 (1791).
Myrobalanus, Gærtner, *Fruct.* ii. 90, t. 97, f. 2 (1791).
Catappa, Gærtner, *Fruct.* ii. 206, t. 127, f. 3 (1791).
Gimbernatia, Ruiz & Pavon, *Prodr. Fl. Peruv.* 138, t. 36 (1794).
Fatrea, A. L. de Jussieu, *Ann. Mus.* v. 223 (1805).
Hudsonia, Lunan, *Hort. Jam.* ii. 310 (not Linnæus) (1814).
Pentaptera, De Candolle, *Mém. Soc. Phys. Genève*, iv. 5 (1828); *Prodr.* iii. 14. — Endlicher, *Gen.* 1180.
Chicharronia, A. Richard, *Fl. Cub.* 529 (1845).

Trees or shrubs, with astringent properties. Leaves alternate or rarely opposite or subopposite, usually clustered at the ends of the branches, sessile or sometimes petiolate, generally entire and marked with minute pellucid dots, glandular or eglandular at the base. Flowers in the axils of minute bractlets, green, creamy white, or bright-colored, in lax elongated simple or branched spikes, rarely contracted into dense heads, axillary or clustered on the old nodes. Calyx-tube ovoid or subcylindrical, constricted above the ovary, the short limb urceolate or campanulate, five-toothed or divided, usually deciduous. Disk epigynous or annular. Stamens ten, in two ranks, inflexed in æstivation, inserted on the limb of the calyx, the five inferior opposite its teeth, the five superior shorter and alternating with them; filaments subulate or filiform, exserted; anthers minute, attached on the back, sagittate or oblong, introrse, two-celled, the cells opening longitudinally. Ovary included in the tube of the calyx, one-celled; style subulate, often thickened or villose at the base, terminated by a simple minute stigma; ovules two or rarely three, suspended from the apex of the cell on elongated slender funiculi, anatropous; raphe ventral, the micropyle superior. Fruit ovoid, terete, angular or compressed, sometimes with two to five longitudinal wings, or samariform, one-seeded; exocarp usually thin, fleshy or coriaceous; endocarp coriaceous or bony. Seed elongated, ovoid or terete; testa membranaceous. Embryo destitute of albumen; cotyledons convolute, fleshy; radicle minute, superior, turned toward the hilum.

Terminalia, as the genus is now enlarged, inhabits the tropics of the two worlds; eighty or ninety species[1] are distinguished, of which the larger part are found in Asia and Africa.

[1] Willdenow, *Spec.* iv. 967. — Humboldt, Bonpland & Kunth, *Nov. Gen. et Spec.* vi. 113. — Kunth, *Syn. Pl. Æquin.* iii. 399. — De Candolle, *Prodr.* iii. 10. — Gray, *Bot. Wilkes Explor. Exped.* i. 615. — Miquel, *Fl. Ind. Bat.* i. 598. — Harvey & Sonder, *Fl. Cap.* ii. 508. — Thwaites, *Enum. Pl. Zeylan.* 103. — Grisebach, *Fl. Brit. W. Ind.* 276. — Bentham, *Fl. Australi.* ii. 496. — Eichler, *Martius Fl. Brasil.* xiv. pt. ii. 82. — Oliver, *Fl. Trop. Afr.* ii. 415. — Kurz, *Forest Fl. Brit. Burm.* i. 453. — Hooker f. *Fl. Brit. Ind.* ii. 443. — Baker, *Fl. Maur. and Seych.* 110. — Hemsley, *Bot. Biol. Am. Cent.* i. 402. — Vidal y Soler, *Fl. Forest. Arch. Filip.* 135.

Several of the species are valuable timber-trees;[1] the bark of all is astringent and rich in tannin, and some produce astringent fruit used in dyeing and tanning.[2] Galls formed on the young leaves of *Terminalia Chebula*,[3] an Indian species, are strongly astringent and serve as a substitute for Oak-galls in ink-making.[4] *Terminalia Catappa*,[5] the Indian Almond-tree, one of the largest and most beautiful members of the genus, is a favorite shade and avenue tree in all tropical countries; it produces valuable timber and edible fruit from which an oil with the odor and flavor of Almond-oil is prepared, and from the bark and leaves is extracted a black pigment used by the natives of India to color their teeth.[6]

The generic name, formed from *terminus*, was used by Linnæus in allusion to the usual arrangement of the leaves of these trees at the ends of the branches.

[1] Brandis, *Forest Fl. Brit. Ind.* 222. — Gamble, *Man. Indian Timbers*, 179.

[2] Under the name of myrobalans the dried astringent fruits of several Indian species of Terminalia once had a place in the European pharmacopœia (Dale, *Pharm.* 334.— Linnæus, *Mat. Med.* 178); in India they are still used medicinally (Honigberger, *Mat. Med.* 313), and are exported in great quantities to China, where they are employed as a tonic and mild laxative (Smith, *Chinese Mat. Med.* 215). For tanning leather the fruits of Terminalia are now largely imported from India into Europe; two kinds are known, chebulic myrobalans, the fruit of *Terminalia Chebula*, and the beleric myrobalans, the fruit of *Terminalia Belerica* (Roxburgh, *Hort. Beng.* 33. — De Candolle, *Prodr.* iii. 12. — Beddome, *Fl. Sylv. S. Ind.* i. 19, t. 19. — Brandis, *l. c.* 222. — Hooker f. *Fl. Brit. Ind.* ii. 445); they contain from thirty to thirty-five per cent. of tannic acid in the pulp which surrounds the stones, and make soft porous leather of a yellow color (Guibourt, *Hist. Drog.* ed. 7, iii. 282, f. 665–670. — Spons, *Encyclopædia of the Industrial Arts, Manufactures, and Raw Commercial Products*, ii. 1226, 1987. — Balfour, *Cyclopædia of India*, ed. 3, ii. 1031. — Jackson, *Commercial Botany of the Nineteenth Century*, 120. — *U. S. Nat. Dispens.* ed. 16, 1865).

[3] Retzius, *Obs.* v. 31 (1790). — Willdenow, *Spec.* iv. 969. — De Candolle, *l. c.* — Beddome, *l. c.* 27, t. 27. — Brandis, *l. c.* 223, t. 29. — Hooker f. *l. c.* 446.

[4] Voigt, *Hort. Sub. Calcutt.* 37. — Drury, *Useful Plants of India*, 431. — Balfour, *l. c.* 850.

[5] Linnæus, *Mant.* 519 (1771). — Willdenow, *l. c.* 967. — Jacquin, *Icon. Pl. Rar.* i. 19, t. 197. — De Candolle, *l. c.* 11. — Nuttall, *Sylva*, i. 110, t. 32. — *Bot. Mag.* lvii. t. 3004. — Beddome, *l. c.* 20, t. 20. — Hooker, f. *l. c.* 444.

[6] Spons, *l. c.* 1396. — Balfour, *l. c.* 850.

TERMINALIA BUCERAS.

Black Olive Tree.

FLOWERS perfect, in simple axillary spikes; calyx campanulate, 5-toothed, persistent. Fruit ovoid, conical-oblique, irregularly 5-angled, coriaceous. Leaves alternate, eglandular, clustered at the ends of the branches, persistent.

Terminalia Buceras, Bentham & Hooker, *Gen.* i. 685 (1865). — Sargent, *Bot. Gazette*, xi. 314; *Garden and Forest*, ii. 435.

Bucida Buceras, Browne, *Nat. Hist. Jam.* t. 23, f. 1 (1756). — Linnæus, *Amœn.* v. 397; *Spec.* ed. 2, 556. — Lamarck, *Ill.* ii. 484, t. 356. — Willdenow, *Spec.* ii. 630. — Poiret, *Lam. Dict.* Suppl. i. 733. — Persoon, *Syn.* i. 485. — *Bot. Reg.* xi. t. 907. — Sprengel, *Syst.* ii. 359. — De Candolle, *Prodr.* iii. 10. — Don, *Gen. Syst.* ii. 657. — Spach, *Hist. Vég.* iv. 297. — Eichler, *Martius Fl. Brasil.* xiv. pt. ii. 94, t. 35, f. 1.

Bucida angustifolia, De Candolle, *Prodr.* iii. 10 (1828). — Don, *Gen. Syst.* ii. 657. — A. Richard, *Fl. Cub.* ii. 240. — Grisebach, *Cat. Pl. Cub.* 109.

Bucida Buceras, var. **angustifolia**, Eichler, *Martius Fl. Brasil.* xiv. pt. ii. 95 (1867).

A tree, with naked buds, in Florida sometimes forming a single straight trunk or sometimes a short prostrate trunk two to three feet in diameter, from which usually spring several straight upright stems forty to fifty feet in height and twelve to eighteen inches in diameter. The principal branches are stout, and, spreading nearly at right angles with the trunk, make a broad handsome head; they are covered, like the trunk, with thick bark, the gray surface of which is tinged with orange-brown and broken into short appressed scales. The branchlets are slender, terete, trichotomously or dichotomously forked, and zigzag by their unequal and irregular growth, the terminal bud often becoming a short thick spur, while the lateral buds develop into branches, or sometimes one or both into slender spines one or two inches in length; when they first appear they are clothed with short pale rufous pubescence which often does not entirely disappear before the end of their second year, when they are covered with light reddish brown bark which separates into thin narrow shreds. The leaves are obovate to spatulate-lanceolate, rounded and slightly emarginate or minutely apiculate at the apex, and gradually contracted at the base into short petioles; they are thick and coriaceous, with slightly thickened revolute margins, bluish green on the upper, and yellow-green on the lower surface, pubescent while young, especially below, and at maturity are glabrous with the exception of the rufous hairs which cover the under surface of the stout midribs and the petioles; they are from two to three inches long, an inch to an inch and a half broad, with petioles varying from one third to one half of an inch in length, and are crowded together at the ends of the spurs and of the lateral branches. In Florida the flowers appear in April, in slender spikes thickly coated with rufous pubescence, and an inch and a half to two inches in length; they develop in the axils of lanceolate acute caducous bractlets, from globular sessile buds, and are greenish white, hairy on the outer surface, and an eighth of an inch long. The calyx-lobes are minute and pubescent on both surfaces; the five long stamens are inserted opposite the lobes under the five-lobed epigynous hairy disk, and the five shorter alternate stamens a little higher up on the calyx-tube; the anthers are sagittate, and the base of the slender style is coated with pale hairs.[1] The fruit is indehiscent, one third of an inch in length, light brown, puberulous on the outer surface, crowned with the enlarged persistent calyx, and composed of a thin membranaceous exocarp inseparable from the crustaceous endocarp which is porous toward the interior. The seed is ovate and acute, with a broad raphe and a thin chestnut-brown testa.

[1] Eichler (*Martius Fl. Brasil.* xiv. pt. ii. 94) describes male and female flowers scattered irregularly in the same spike. On the specimens from Florida, however, the flowers all appear to be perfect.

In the United States *Terminalia Buceras* has been found only on Elliott's Key in southern Florida; it is widely distributed in brackish marshes through the West Indies,[1] and on the shores of the Caribbean Sea and of the Bay of Panama.[2]

The wood of *Terminalia Buceras* is exceedingly heavy, hard, and close-grained, the layers of annual growth being difficult to distinguish; it contains numerous minute evenly distributed open ducts and thin obscure medullary rays, and is light yellow-brown sometimes slightly streaked with orange, the thick sapwood, composed of thirty to forty layers of annual growth, being clear pale yellow. The specific gravity of the absolutely dry wood is 1.0406, a cubic foot weighing 64.85 pounds.[3] The bark was once used in the West Indies for tanning leather.

The earliest account of *Terminalia Buceras* was published in 1696 by Sir Hans Sloane in his Catalogue of the Plants of Jamaica,[4] and the tree was first noticed in the United States[5] by Mr. A. H. Curtiss.[6] According to Aiton,[7] it was introduced into English gardens in 1793 by Captain Bligh[8] of the English navy.

The specific name, from *βοῦς* and *κέρας*, relates to the long slender horn-shaped spongy bodies into which the terminal flowers are occasionally changed.[9]

[1] Vahl, *Eclog.* i. 50. — Swartz, *Obs.* 180. — A. Richard, *Fl. Cub.* ii. 240. — Grisebach, *Fl. Brit. W. Ind.* 276; *Cat. Pl. Cub.* 109. — Eggers, *Bull. U. S. Nat. Mus.* No. 13, 54 (*Fl. St. Croix and the Virgin Islands*).

[2] Hemsley, *Bot. Biol. Am. Cent.* i. 402.

[3] Sargent, *Garden and Forest*, iii. 355.

[4] *Mangle Julifera, foliis subrotundis versus summitates latissimis, confertim nascentibus, cortice ad coria densanda utili, Cat. Pl. Jam.* 156; *Nat. Hist. Jam.* ii. 67, t. 189, f. 3. — Ray, *Hist. Pl.* iii. *Dendr.* 116.

Buceras ramulis flexuosis tenuioribus, foliis obovatis confertis, spicis plurimis terminalibus, Browne, *Nat. Hist. Jam.* 221.

[5] Early on the morning of April 19, 1886, A. H. Curtiss, C. E. Faxon, and C. S. Sargent landed at Filer's plantation on the south side of Elliott's Key; one of the party immediately noticed growing close to the house in a field from which most of the trees had been cleared to make room for a plantation of Pineapples, a Palm of an undescribed genus, Pseudophœnix, and a few yards distant, on the borders of the forest, Mr. Curtiss discovered a grove of Terminalia trees covered with flowers.

[6] See ii. 50.

[7] *Hort. Kew.* ed. 2, iii. 61.

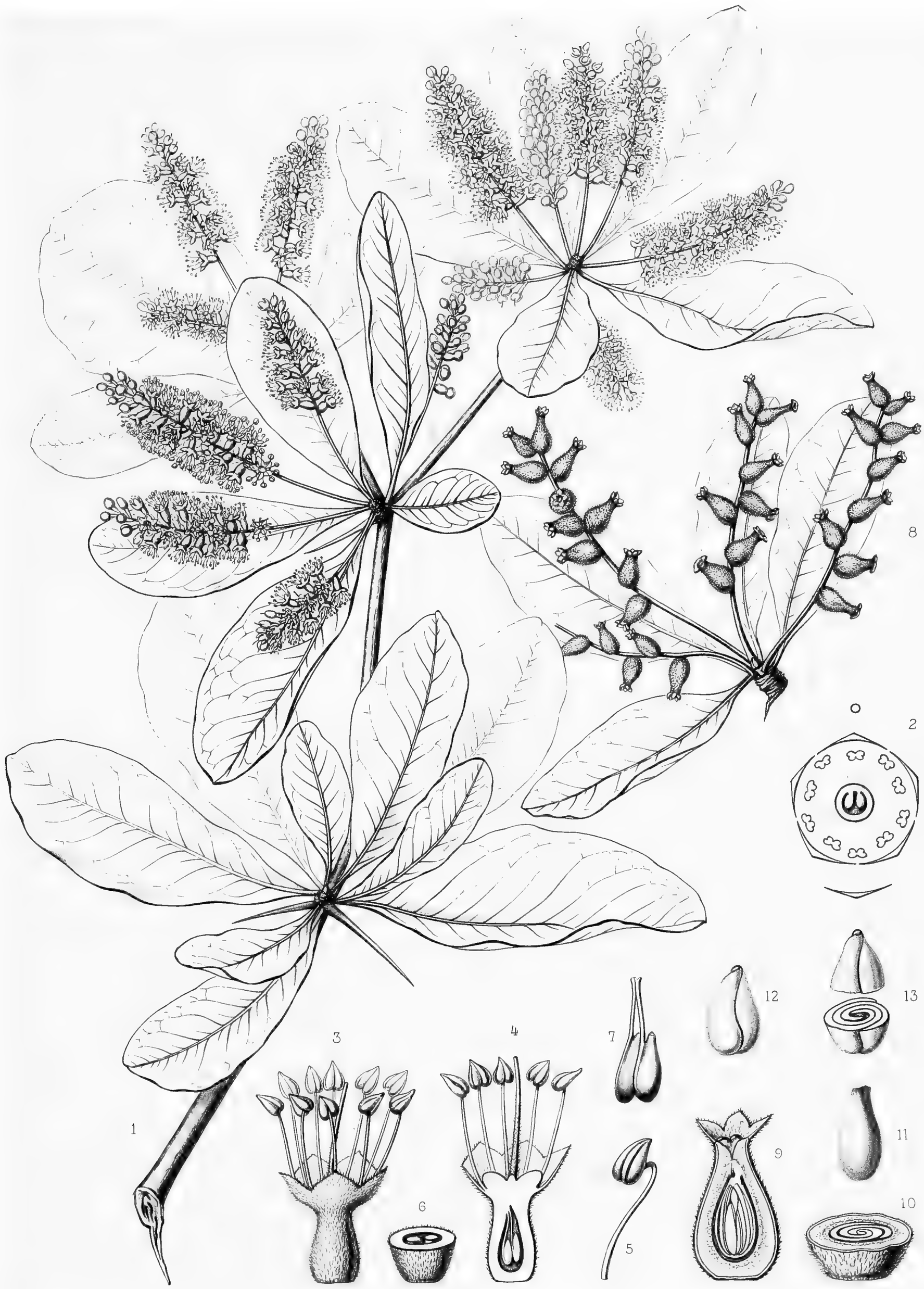
[8] See ii. 18.

[9] Whether this malformation is produced by an insect or by fungal disease does not seem to be known; at least I have not been able to find that anything definite has been published on the subject, although the monstrosity appeared in Browne's excellent figure of the species. It has not been noticed on the Florida trees.

EXPLANATION OF THE PLATE.

Plate CCI. Terminalia Buceras.

1. A flowering branch, natural size.
2. Diagram of a flower.
3. A flower, enlarged.
4. Vertical section of a flower, enlarged.
5. A stamen, enlarged.
6. Cross section of an ovary, enlarged.
7. Two ovules, much magnified.
8. A fruit-bearing spur-like branch, natural size.
9. Vertical section of a fruit, enlarged.
10. Cross section of a fruit, enlarged.
11. A seed, enlarged.
12. An embryo, enlarged.
13. An embryo cut crosswise, enlarged.



C.E.Faxon del. Picart.fr. sc.

TERMINALIA BUCERAS, Benth. et Hook.

A.Riocreux direx.t Imp. R.Taneur, Paris.

CONOCARPUS.

FLOWERS perfect, in dense capitate heads; calyx 5-lobed, the lobes valvate in æstivation; petals 0; stamens usually 5; ovary 1-celled; ovules 2, suspended. Fruits crustaceous, indehiscent, 1-seeded, retrorsely imbricated in subglobose heads. Leaves alternate, entire, persistent, destitute of stipules.

Conocarpus, Linnæus, *Gen.* 376 (1737). — A. L. de Jussieu, *Gen.* 75. — Meisner, *Gen.* 110. — Endlicher, *Gen.* 1181. — Bentham & Hooker, *Gen.* i. 686.

Rudbeckia, Adanson, *Fam. Pl.* ii. 80 (not Linnæus) (1763).
Terminalia, Baillon, *Hist. Pl.* vi. 280, in part (1877).

A tree or shrub, with angled branchlets, naked buds, and astringent properties. Leaves alternate, short-petiolate, narrowly ovate or obovate, acute, gradually contracted and biglandular at the base, entire, coriaceous, glabrous or sericeous, persistent. Flowers in dense capitate heads in narrow leafy terminal panicles. Bracts and bractlets acute, coated with pale hairs, caducous. Peduncles stout, covered with pale tomentum, bracteolate near the middle. Calyx-tube truncate and obliquely compressed at the base, not produced above the ovary, clothed with long white hairs, the limb campanulate, five-parted to the middle, the divisions ovate, acute, erect, pubescent on the outer and puberulous on the inner surface, deciduous. Disk epigynous, five-lobed, hairy. Stamens usually five, inserted in one rank on the base of the calyx-limb, or rarely seven or eight in two ranks; filaments filiform, subulate, exserted; anthers minute, cordate, attached on the back below the middle, introrse, two-celled, the cells opening longitudinally. Ovary inferior, one-celled; style slender, subulate, thickened and villose at the base, tipped with a simple stigma; ovules two, suspended from the apex of the cell, collateral, anatropous; micropyle superior, raphe ventral. Fruits scale-shaped, broadly obovate, pointed, recurved, and covered at the apex with short pale tomentum, densely imbricated in ovoid reddish heads; exocarp coriaceous-corky, produced into broad lateral wings; endocarp thin, crustaceous, indistinct, inseparable. Seed irregularly ovoid, exalbuminous; testa membranaceous, pale chestnut-brown. Embryo filling the cavity of the seed; cotyledons convolute; radicle short, erect, turned towards the hilum.

The wood of Conocarpus is very heavy, hard, strong, and close-grained, with numerous obscure medullary rays; it is dark yellow-brown, with thin lighter colored sapwood composed of ten or twelve layers of annual growth. The specific gravity of the absolutely dry wood is 0.9900, a cubic foot weighing 61.70 pounds. It burns slowly like charcoal, and is highly valued for fuel. The bark is bitter and astringent, and has been used in tanning leather, and in medicine as an astringent and tonic.[1]

The generic name, from κῶνος and καρπὸς, relates to the cone-like shape of the head of fruits. The genus consists of a single species.

[1] Descourtilz, *Fl. Méd. Antill.* vi. 68, t. 399. — Rosenthal, *Syn. Pl. Diaphor.* 902. — Eichler, *Martius Fl. Brasil.* xiv. pt. ii. 127.

CONOCARPUS ERECTA.

Buttonwood.

Conocarpus erecta, Linnæus, *Spec.* 176 (1753). — Miller, *Dict.* ed. 8, No. 1. — Lamarck, *Dict.* ii. 96; *Ill.* ii. 74, t. 126, f. 1. — Gærtner, *Fruct.* ii. 470, t. 177, f. 3. — Willdenow, *Spec.* i. 994. — Titford, *Hort. Bot. Am.* 47. — Roemer & Schultes, *Syst.* v. 573. — De Candolle, *Prodr.* iii. 16. — Spach, *Hist. Vég.* iv. 304. — Don, *Gen. Syst.* ii. 661. — Dietrich, *Syn.* i. 879. — Torrey & Gray, *Fl. N. Am.* i. 485. — Nuttall, *Sylva*, i. 113, t. 33. — Chapman, *Fl.* 136. — Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix. 87.

Conocarpus acutifolia, Roemer & Schultes, *Syst.* v. 574 (1819). — Dietrich, *Syn.* i. 879.

A tree, forty to sixty feet in height, with a trunk twenty to thirty inches in diameter, and slender branches which form a narrow regular head;[1] or sometimes a low shrub with semiprostrate stems.[2] The bark of the trunk is dark brown, and is divided by irregular reticulating fissures into broad flat ridges broken on the surface into small thin appressed scales. The branchlets are slender, conspicuously winged, light red-brown, and usually glabrous, but in one form coated, like the leaves, with silky pubescence; in their second year they are terete and marked with large orbicular leaf-scars. The leaves, when they first appear, are slightly puberulous on the lower surface, or, in the variety *sericea*,[3] are coated with pale silky persistent pubescence; they vary from two to four inches in length and from half an inch to an inch and a half in width, and are borne on stout broad petioles half an inch long; they are lustrous, dark green or pale on the upper surface, and paler on the lower, with broad orange-colored midribs, obscure primary veins, and reticulated veinlets. The flowers are produced throughout the year in panicles six to twelve inches long; the heads, on peduncles which vary from half an inch to an inch and a half in length, are one third of an inch across, or about half the size of the cones of fruit.

The Buttonwood inhabits, with the Red Mangrove, the low muddy tide-water shores of lagoons and bays. In the United States it is common in southern Florida from Cape Canaveral on the east coast and Cedar Keys on the west to the southern islands, growing to a larger size on Lost Man's River near Cape Sable than in other parts of the state; at its northern limit it is reduced to a low shrub. It is common in the Antilles,[4] on the shores of Central America and tropical South America,[5] on the Galapagos Islands,[6] and on the east coast of Africa.[7]

Conocarpus erecta was first described by Marggraf[8] in his Natural History of Brazil,[9] published

[1] *Conocarpus erecta*, var. *arborea*, De Candolle, *Prodr.* iii. 16 (1828). — Grisebach, *Fl. Brit. W. Ind.* 277. — Eichler, *Martius Fl. Brasil.* xiv. pt. ii. 102.

[2] *Conocarpus erecta*, var. *procumbens*, De Candolle, *l. c.* (1828). — Eichler, *l. c.* — Grisebach, *l. c.* — Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix. 87.

Conocarpus procumbens, Linnæus, *Spec.* 177 (1753). — Miller, *Dict.* ed. 8, No. 2. — Jacquin, *Stirp. Am.* 79, t. 52, f. 2. — Lamarck, *Dict.* ii. 96; iii. 699; *Ill.* ii. 74, t. 126, f. 2. — Gærtner f. *Fruct.* iii. 205, t. 216, f. 4. — Roemer & Schultes, *Syst.* v. 573. — Dietrich, *Syn.* i. 879. — Grisebach, *l. c.*

[3] *Conocarpus erecta*, var. *sericea*, De Candolle, *l. c.* (1828). — Chapman, *Fl.* 136. — Grisebach, *l. c.* — Eichler, *l. c.*

[4] Jacquin, *Hist. Select. Stirp. Am.* 41, t. 78. — *Icon. Am. Gewäch.* i. 12, t. 39. — A. Richard, *Fl. Cub.* ii. 243. — Grisebach, *l. c.* 277.

[5] Humboldt, Bonpland & Kunth, *Nov. Gen. et Spec.* vi. 113. — Kunth, *Syn. Pl. Æquin.* iii. 401. — Eichler, *l. c.* t. 35, f. 2. — Hemsley, *Bot. Biol. Am. Cent.* i. 403.

[6] Andersson, *Stockh. Acad. Handl.* 1853, 108 (*Om Galapagos-Öarnes Veg.*).

[7] Oliver, *Fl. Trop. Afr.* ii. 417.

[8] Georg Marggraf (1610–1644), a native of Liebstadt and a physician and naturalist, visited Brazil with Willem Piso under the auspices of the Duke of Nassau. After extensive travels and explorations, he died in Guiana in 1644 from the effects of exposure to the climate. In 1648, four years after the death of Marggraf, the earliest classical volume upon the Natural History of Brazil, containing his own and Piso's observations, was published by Jan de Laet in Leyden and Amsterdam. *Marcgravia*, a genus of tropical American shrubs of the Camellia family, was dedicated to him by Plumier.

[9] *Frutex instar Salicis pumilæ, foliis Salignis, Hist. Nat. Bras.* 76, f.

Alno similis arbor, J. Bauhin, *Hist. Pl.* i. lib. viii. 155.

Salix Brasiliensis capitulifera, Jonston, *Dendrographia*, lib. ix. 446.

in 1648, and was first noticed in the United States on Key West. According to Aiton, it was cultivated in England in 1755 by Philip Miller.

Alno affinis Americana, Ligustri folio, fructu spicato rubro, Breyne, *Prodr.* ii. ed. 1739, 41. — Plukenet, *Alm. Bot.* 18.

Manghala arbor Curassavica, foliis salignis, Hermann, *Parad. Bat. Prodr.* 351. — Commelyn, *Hort.* 115, t. 60. — Catesby, *Nat. Hist. Car.* ii. 33, t. 33.

Alnus maritima Myrtifolia Coriariorum, Plukenet, *Phyt.* t. 240, f. 3.

Alni fructu, laurifolia arbor maritima, Sloane, *Cat. Pl. Jam.* 135 ; *Nat. Hist. Jam.* ii. 18, t. 161, f. 2. — Ray, *Hist. Pl.* iii. *Dendr.* 11.

Conocarpus, Linnæus, *Hort. Cliff.* 485.

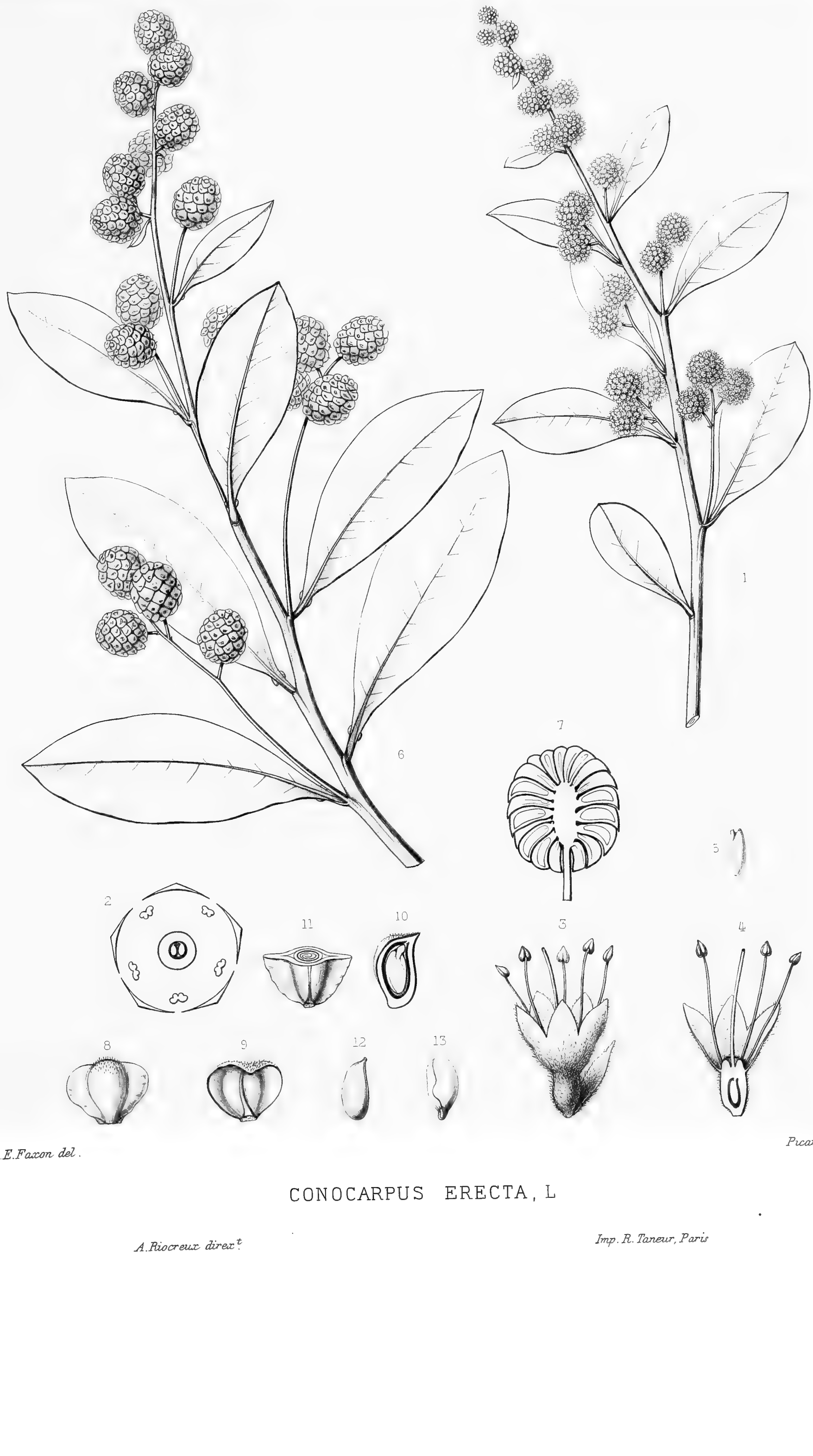
Conocarpus foliis oblongis, petiolis brevibus, floribus in caput conicum collectis, Browne, *Nat. Hist. Jam.* 159.

Conocarpus erecta, foliis oblongis, Plumier, *Pl. Am.* ed. Burmann, 135, t. 144, f. 2.

EXPLANATION OF THE PLATE.

Plate CCII. Conocarpus erecta.

1. A flowering branch, natural size.
2. Diagram of a flower.
3. A flower, enlarged.
4. Vertical section of a flower, enlarged.
5. An ovule, much magnified.
6. A fruiting branch, natural size.
7. Vertical section of a head of fruits, enlarged.
8. A fruit, inner face, enlarged.
9. A fruit, outer face, enlarged.
10. Vertical section of a fruit, enlarged.
11. Cross section of a fruit, enlarged.
12. A seed, enlarged.
13. An embryo, much magnified.



C.E.Faxon del.

Picart fr. sc.

CONOCARPUS ERECTA, L

A.Riocreux dirext.

Imp. R. Taneur, Paris

LAGUNCULARIA.

FLOWERS usually perfect, in axillary and terminal spikes; calyx 5-lobed, the lobes valvate in æstivation; petals 5, valvate in æstivation, caducous; stamens 10; ovary 1-celled; ovules 2, suspended. Fruit 10-ribbed, coriaceous, indehiscent, 1-seeded. Leaves opposite, entire, persistent, destitute of stipules.

Laguncularia, Gærtner f. *Fruct.* iii. 209 (1805). — Meisner, *Gen.* 110. — Endlicher, *Gen.* 1181. — Bentham & Hooker, *Gen.* i. 688. — Baillon, *Hist. Pl.* vi. 278.

? **Horau**, Adanson, *Fam. Pl.* ii. 80 (1763).

Sphenocarpus, Richard, *Anal. Fruit*, 92 (1808).

A tree, with scaly bark, terete pithy branchlets, naked buds, and astringent properties. Leaves opposite, petiolate, involute in vernation, glabrous, thick and coriaceous, oblong or elliptical, obtuse or emarginate at the apex, entire, marked toward the margin with minute tubercles, the petioles conspicuously biglandular, persistent. Flowers usually perfect or polygamo-monœcious,[1] minute, flattened, greenish white, sessile, in simple terminal axillary tomentose spikes generally collected in leafy panicles. Bracts and bractlets ovate, acute, coated with pale tomentum. Calyx-tube turbinate, not produced above the ovary, with five prominent ridges opposite the lobes of the limb and five intermediate lesser ridges, bracteolate near the middle with two minute persistent bractlets, and coated with dense pale tomentum, the limb urceolate, five-parted to the middle, the divisions triangular, obtuse or acute, erect, persistent. Disk epigynous, flat, ten-lobed, the five lobes opposite the petals broader than those opposite the divisions of the calyx-limb, hairy. Petals five, nearly orbicular, contracted into short claws, inserted in the bottom of the calyx-limb, ciliate on the margins, caducous. Stamens ten, inserted in two ranks on the limb of the calyx; filaments slender, subulate, slightly exserted; anthers cordate, apiculate, attached on the back below the middle, two-celled, the cells opening longitudinally. Ovary one-celled; style slender, short, crowned with a slightly two-lobed capitate stigma; ovules two, suspended from the apex of the cell, elongated, collateral; raphe ventral, micropyle superior; funicle short or obsolete. Fruit hoary-pubescent, elongated, obovoid, flattened, crowned with the calyx-limb, unequally ten-ribbed, the two lateral ribs produced into narrow wings; exocarp coriaceous, corky towards the interior, inseparable from the thin crustaceous endocarp, dark red and lustrous on the inner surface. Seed suspended, obovoid-oblong, destitute of albumen; testa membranaceous, dark red. Embryo filling the cavity of the seed; radicle elongated, slightly longer than and nearly inclosed by the convolute green cotyledons.

The wood of Laguncularia is heavy, hard, strong, and close-grained, with a satiny surface and numerous obscure medullary rays; it is dark yellow-brown, with lighter colored sapwood composed of ten or twelve layers of annual growth. The specific gravity of the absolutely dry wood is 0.7137, a cubic foot weighing 44.48 pounds. The bark, which contains a large amount of tannic acid, is sometimes used in tanning leather, and as an astringent and tonic.[2] There is a single species.

The generic name, from *laguncula*, relates to the supposed resemblance of the fruit to a flask.

[1] The flowers of Laguncularia have usually been described as polygamous or polygamo-monœcious, but in all the specimens from Florida which I have seen they are perfect.

[2] Rosenthal, *Syn. Pl. Diaphor.* 902. — Eichler, *Martius Fl. Brasil.* xiv. pt. ii. 127.

LAGUNCULARIA RACEMOSA.

White Buttonwood. White Mangrove.

Laguncularia racemosa, Gærtner f. *Fruct.* iii. 209, t. 217 (1805). — De Candolle, *Prodr.* iii. 17. — Don, *Gen. Syst.* ii. 662. — Spach, *Hist. Vég.* iv. 305. — Nuttall, *Sylva*, i. 117, t. 34. — Chapman, *Fl.* 136. — Baillon, *Hist. Pl.* vi. 278. — Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix. 87.

Conocarpus racemosa, Linnæus, *Syst.* ed. 10, 930 (1759); *Spec.* ed. 2, 251. — Willdenow, *Spec.* i. 995. — Poiret, *Lam. Dict.* Suppl. iii. 343. — Roemer & Schultes, *Syst.* v. 574.

Schousboa commutata, Sprengel, *Syst.* ii. 332 (1825).

Bucida Buceras, Vellozo, *Fl. Flum.* iv. t. 87 (not Browne) (1827).

Laguncularia glabrifolia, Presl, *Rel. Haenk.* ii. 22 (1835). — Walpers, *Rep.* ii. 63. — Chapman, *Fl.* 136.

A tree, thirty to sixty feet in height, with a trunk twelve to twenty inches in diameter, and stout spreading branches forming a narrow round-headed top; or, in the northern part of the territory which it inhabits in Florida, a low shrub. The bark of the trunk is a quarter of an inch thick, the brown surface slightly tinged with red and divided into long ridge-like scales. The branchlets, when they first appear, are somewhat angled, glabrous, often marked with minute pale spots, and dark red-brown; in their second year they are terete, light red-brown or orange-color, thickened at the nodes, and marked by conspicuous ovate leaf-scars. The leaves are an inch and a half to two inches and a half in length and an inch to an inch and a half in width, with red petioles half an inch long; when they unfold they are slightly tinged with red and at maturity are dark green on the upper surface and lighter green or pale below. The flower-spikes, which are produced throughout the year from the axils of young leaves, are densely coated with hoary tomentum, and are an inch and a half to two inches in length. The flowers are a quarter of an inch long, or rather less than half the length of the fruit.

Laguncularia racemosa, with Rhizophora and Conocarpus, inhabits the muddy tidal shores of tropical bays and lagoons; in the United States it is common in southern Florida from Cape Canaveral on the east coast and Cedar Keys on the west coast to the southern islands, growing on the borders of Shark River to the largest size which it reaches in the state. It is a common littoral tree in Bermuda,[1] the West Indian islands,[2] Mexico and Central America,[3] tropical South America,[4] and western Africa.[5]

Laguncularia racemosa was first described by Sir Hans Sloane in his Catalogue of the Plants of Jamaica, published in 1696;[6] and it appears to have been first noticed in the United States on Key West by Dr. J. L. Blodgett.[7]

[1] Lefroy, *Bull. U. S. Nat. Mus.* No. 25, 74 (*Bot. Bermuda*).

[2] Jacquin, *Stirp. Am.* 80, t. 53; *Hist. Select. Stirp. Am.* 41, t. 79. — *Icon. Am. Gewäch.* i. 12, t. 40. — Swartz, *Obs.* 79. — Lunan, *Hort. Jam.* i. 10. — A. Richard, *Fl. Cub.* ii. 244. — Grisebach, *Fl. Brit. W. Ind.* 276; *Cat. Pl. Cub.* 109. — Eggers, *Bull. U. S. Nat. Mus.* No. 13, 54 (*Fl. St. Croix and the Virgin Islands*).

[3] Humboldt, Bonpland & Kunth, *Nov. Gen. et Spec.* vii. 255. — Kunth, *Syn. Pl. Æquin.* iv. 256. — Bentham, *Bot. Voy. Sulphur*, 14, 92. — Hemsley, *Bot. Biol. Am. Cent.* i. 403.

[4] St. Hilaire, *Fl. Bras. Merid.* ii. 244. — Eichler, *Martius Fl. Brasil.* xiv. pt. ii. 102, t. 35, f. 3.

[5] Hooker f. & Bentham, *Hooker Niger Fl.* 337. — Oliver, *Fl. Trop. Afr.* ii. 419.

[6] *Mangle Julifera, foliis ellipticis ex adverso nascentibus, Cat. Pl. Jam.* 156; *Nat. Hist. Jam.* ii. 66, t. 187, f. 1. — Ray, *Hist. Pl.* iii. *Dendr.* 115.

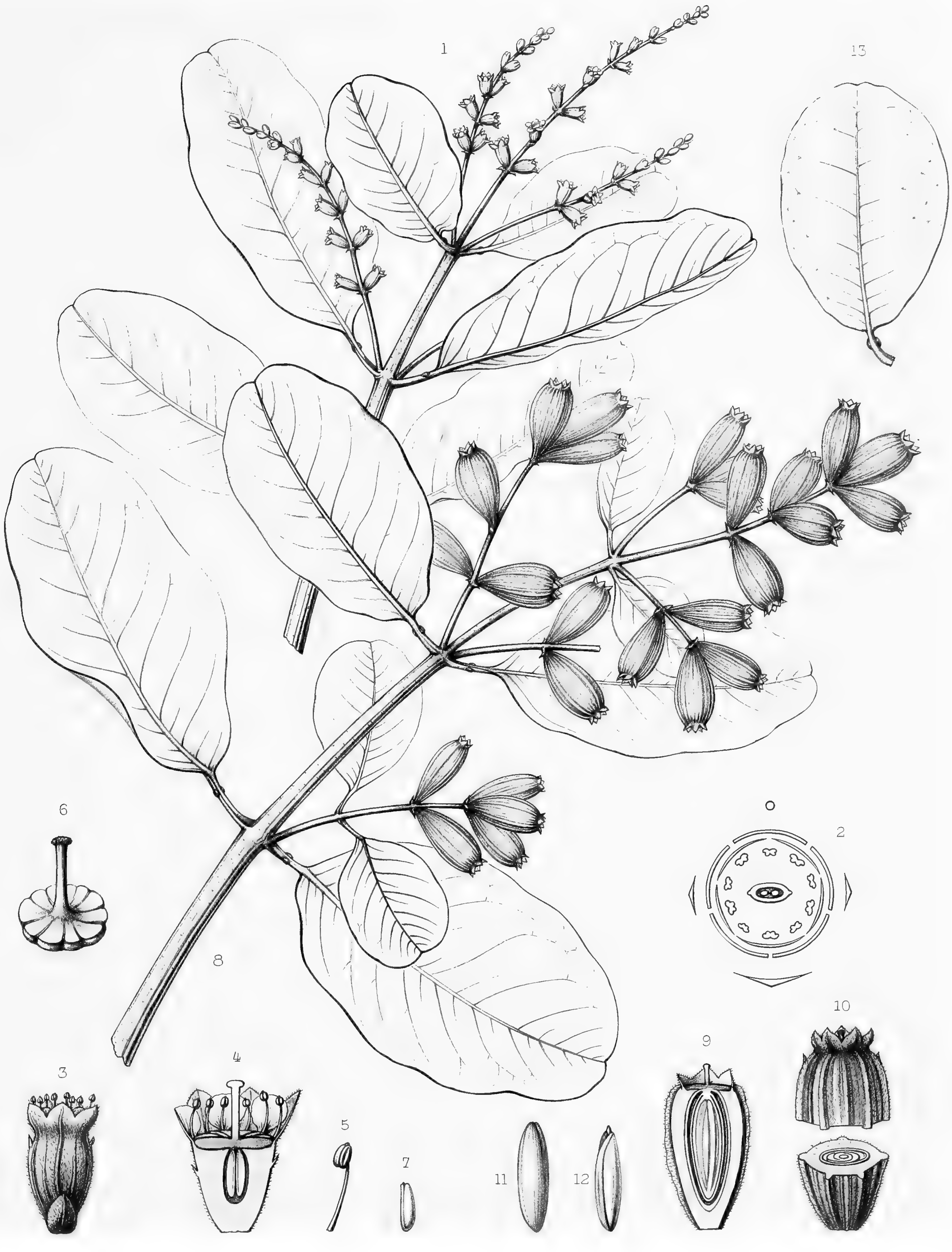
Conocarpus foliis elliptico-ovatis, petiolis biglandulatis, racemis laxis, fructibus sejunctis, Browne, *Nat. Hist. Jam.* 159.

[7] See i. 33.

EXPLANATION OF THE PLATE.

PLATE CCIII. LAGUNCULARIA RACEMOSA.

1. A flowering branch, natural size.
2. Diagram of a flower.
3. A flower, enlarged.
4. Vertical section of a flower, enlarged.
5. A stamen, enlarged.
6. A disk and pistil, enlarged.
7. An ovule, much magnified.
8. A fruiting branch, natural size.
9. Vertical section of a fruit, enlarged.
10. A fruit cut transversely, enlarged.
11. A seed, enlarged.
12. An embryo, much magnified.
13. A leaf, with tubercles, natural size.



C.E. Faxon del. Picart sc.

LAGUNCULARIA RACEMOSA, Gœrtn. f.

A. Riocreux dirext. Imp. R. Taneur, Paris.

ANAMOMIS.

Flowers perfect; calyx usually 4-lobed, the lobes imbricated in æstivation; petals usually 4, imbricated in æstivation; stamens indefinite, in many ranks; ovary inferior, 2 to 4-celled; ovules numerous in each cell. Fruit baccate, 1 or rarely 2-seeded. Leaves opposite, penniveined, chartaceous or coriaceous, persistent, destitute of stipules.

Anamomis, Grisebach, *Fl. Brit. W. Ind.* 240 (1864). **Myrtus**, Bentham & Hooker, *Gen.* i. 714 (in part) (1865). — Baillon, *Hist. Pl.* vi. 349 (in part).

Aromatic trees, with terete branchlets. Leaves opposite, ovate or elliptical, petiolate, chartaceous or coriaceous, penniveined, punctate, destitute of stipules, persistent. Flowers in pedunculate, usually three, sometimes five to seven, or occasionally one-flowered cymes. Peduncles axillary, dichotomously branched or rarely simple, furnished immediately below the apex of each division with two lanceolate acute deciduous bractlets. Calyx-tube ovoid, not produced above the ovary, the limb four or rarely five-lobed, the lobes ovate, acute, persistent. Petals four or occasionally five, inserted on the thickened margin of the conspicuous disk, ovate, acute, glandular-punctate, spreading after anthesis. Stamens indefinite, inserted with the petals on the margin of the disk; filaments filiform, inflexed in the bud; anthers oblong, attached on the back below the middle, versatile, introrse, two-celled, the cells opening longitudinally. Ovary two to four-celled; style simple, filiform, crowned with the minute capitate stigma; ovules numerous in each cell, attached irregularly to a central placenta, semianatropous; raphe ventral; micropyle superior. Fruit baccate, subglobose or more or less obliquely oblong, aromatic, crowned with the persistent calyx-limb, one or sometimes two-seeded. Seed reniform, exalbuminous; testa membranaceous. Embryo aromatic, filling the cavity of the seed; cotyledons distinct, obovate, thick and fleshy, flat and rounded at the apex, or more or less pointed, incurved and variously infolded at the apex; radicle basilar, terete, accumbent, from one quarter to one third the length of the cotyledons.

Anamomis is West Indian, with four or five species,[1] one of which reaches the shores and islands of southern Florida. Little is known with regard to the economic value of the species that are not found in Florida. *Anamomis esculenta*,[2] an inhabitant of Hayti, is said to produce edible fruit.

The name of the genus, from *ἀνά* and *ἀμωμίς*, alludes to its aromatic properties.

[1] Grisebach, *Fl. Brit. W. Ind.* 240; *Cat. Pl. Cub.* 90.

[2] Grisebach, *Fl. Brit. W. Ind.* 240 (1864).
Eugenia esculenta, Berg, *Linnæa*, xxvii. 273 (1854).

ANAMOMIS DICHOTOMA.

Naked Wood.

LEAVES ovate or obovate, acute or rounded at the apex.

Anamomis dichotoma, Sargent, *Garden and Forest*, vi. 130 (1893).

Eugenia fragrans, Sims, *Bot. Mag.* xxxi. t. 1242 (not Willdenow teste Grisebach) (1810).

Myrtus dichotoma, Poiret, *Lam. Dict.* Suppl. iv. 53 (1816).

Myrcia? Balbisiana, De Candolle, *Prodr.* iii. 243 (1828) (teste Grisebach).

Eugenia ? dichotoma, De Candolle, *Prodr.* iii. 278 (1828). — Don, *Gen. Syst.* ii. 861. — Nuttall, *Sylva*, i. 103, t. 27. — Dietrich, *Syn.* iii. 64. — Berg, *Linnæa*, xxvii. 261. — Chapman, *Fl.* 131. — Sargent, *Forest Trees N. Am. 10th Census U. S.* ix. 88.

Anamomis punctata, Grisebach, *Fl. Brit. W. Ind.* 240 (1864).

A tree, twenty to twenty-five feet in height, with a trunk six or eight inches in diameter; or often a shrub sending up from the ground numerous slender stems. The bark of the trunk varies from one sixteenth to one eighth of an inch in thickness, with a smooth light red or red-brown surface exfoliating into minute thin scales. The branchlets, which are slender and terete, are at first light red and coated with pale silky hairs; in their second year they are glabrous and covered with light or dark red-brown bark which separates into small thin scales. The leaves are ovate or obovate, acute or rounded and occasionally emarginate at the apex, wedge-shaped at the base, entire, chartaceous and finally subcoriaceous, glabrous, and covered with minute black dots; they are an inch to an inch and a quarter long and half an inch to two thirds of an inch broad, with stout midribs impressed on the upper surface, slightly thickened and revolute margins, and short stout petioles enlarged at the base and covered while young with silky hairs. The flowers, which appear in Florida in May, and are a quarter of an inch across when expanded, are borne in pedunculate cymes produced near the ends of the branches in the axils of the leaves of the year. The peduncles are slender and coated with pale silky hairs, and are sometimes one-flowered and not longer than the leaves; more often they are longer than the leaves, dichotomously branched, and three-flowered, with one flower at the end of the principal division in the fork of its one-flowered branches, which vary from a quarter to half an inch in length; or occasionally they are five to seven-flowered by the development of peduncles from the axils of the bracts of the secondary divisions of the inflorescence. Each branch of the inflorescence is furnished at its apex, immediately beneath the flower, with two lanceolate acute bracts which are nearly as long as the calyx-tube, and which in falling leave prominent persistent scars. The calyx is narrowly ovoid and coated with hoary tomentum, with a four-parted limb, its lobes ovate, rounded at the apex, and much shorter than the ovate acute glandular-punctate white petals. The fruit, which ripens in August in Florida, is reddish brown, a quarter of an inch long, obliquely oblong, obovate or subglobose, crowned by the persistent limb of the calyx, roughened with minute glands, and one or rarely two-seeded; its flesh is thin and rather dry, with an agreeable aromatic flavor. The large reniform seed is covered with a thin light brown membranaceous coat and is extremely fragrant.

Anamomis dichotoma is abundant in rocky woods on the east coast of Florida from Mosquito Inlet to Cape Canaveral; on the west coast it occurs from the banks of the Caloosa River to the shores of Cape Romano; it grows occasionally on Key West and in the neighborhood of Bay Biscayne, and inhabits several of the West Indian islands.

The wood of *Anamomis dichotoma* is very heavy, hard, and close-grained, with numerous thin medullary rays; it is light brown or red, with thick yellow sapwood composed of forty or fifty layers of

annual growth. The specific gravity of the absolutely dry wood is 0.8983, a cubic foot weighing 55.97 pounds.

Anamomis dichotoma was probably first distinguished[1] by the Danish botanist Vahl;[2] in Florida it was discovered on Key West by Dr. J. L. Blodgett.

[1] See Poiret, *Lam. Dict.* Suppl. iv. 54. The flowers of Vahl's plant were, however, described as five-parted.

[2] Martin Vahl (1749–1804) was born at Bergen in Norway and pursued his scientific studies at Copenhagen and afterwards at Upsal, where he became a favorite pupil of Linnæus. In 1779 Vahl was appointed lecturer in the Botanic Garden at Copenhagen, and having filled this position during three years was sent by the King of Denmark on a scientific voyage of observation, during which he traveled extensively in Holland, France, Italy, Spain, northern Africa, Switzerland, and England. Returning to Copenhagen in 1785, he was appointed professor of natural history in the University of that city and was intrusted with the completion of the *Flora Danica* of Oeder. Vahl was the author or editor of the sixth and seventh volumes of this monumental work, which has consumed more than a century in publication. Between 1790 and 1794 he published in three folio volumes, with many plates, the *Symbolæ Botanicæ*, devoted principally to descriptions of plants collected by Forskål in the Orient; in 1796 and 1798 were published the two first volumes of his *Eclogæ Americanæ*, containing figures and descriptions of tropical American plants, the third volume appearing in 1807. Vahl left unfinished, also, his *Enumeratio Plantarum*, of which the first volume was published in 1804, shortly before he died. At his death the King of Denmark purchased his herbarium, manuscripts, and botanical library, which is said to have contained three thousand volumes. *Vahlia*, a genus of south African herbs of the Saxifrage family, was dedicated to him by Thunberg.

EXPLANATION OF THE PLATE.

PLATE CCIV. ANAMOMIS DICHOTOMA.

1. A flowering branch, natural size.
2. A flower, enlarged.
3. Vertical section of a flower, enlarged.
4. Cross section of an ovary, enlarged.
5. A fruiting branch, natural size.
6. Cross section of a fruit, enlarged.
7. Vertical section of a fruit, enlarged.
8. A seed, enlarged.
9. An embryo, enlarged.

C.E.Faxon del. Picart fr. sc.

ANAMOMIS DICHOTOMA, Sarg.

A.Riocreux direx.t Imp. R.Taneur, Paris.

CALYPTRANTHES.

FLOWERS perfect; calyx produced above the ovary, closed in the bud by a deciduous lid; petals 2 to 5, minute, imbricated in æstivation, or 0; stamens indefinite, many-ranked; ovary inferior, 2 or 3-celled; ovules 2 in each cell, or rarely indefinite. Fruit baccate. Leaves opposite, entire, penniveined, pellucid-punctate, persistent, destitute of stipules.

Calyptranthes, Swartz, *Prodr.* 79 (1788). — Meisner, *Gen.* 108. — Endlicher, *Gen.* 1232. — Bentham & Hooker, *Gen.* i. 717. — Baillon, *Hist. Pl.* vi. 352.

Chytralia, Adanson, *Fam. Pl.* ii. 80 (1763).

Calyptranthus, A. L. de Jussieu, *Dict. Sci. Nat.* vi. 274 (1805).

Aromatic trees or shrubs, with terete or angled branchlets. Leaves complanate in vernation, opposite, entire, penniveined, marked with pellucid or resinous dots, petiolate. Flowers bibracteolate, minute, in subterminal or axillary pedunculate many-flowered panicles, their primary and secondary branches often racemose, the ultimate branches cymose. Bracts and bractlets minute, acute, caducous. Flower-buds ovoid or spherical. Calyx-tube turbinate, produced above the ovary, closed in the bud by a slightly four or five-lobed lid-like orbicular limb, opening in anthesis by a circumscissile line, the limb at first attached laterally, finally deciduous. Disk lining the tube of the calyx. Petals, two to five, minute, inserted on the slightly thickened margin of the disk, or wanting. Stamens indefinite, inserted in many ranks on the margin of the disk; filaments filiform, inflexed in the bud, exserted; anthers ovate, attached on the back below the middle, introrse, two-celled, the cells opening longitudinally. Ovary inferior, two to three-celled; style filiform, simple, crowned with a minute capitate stigma; ovules two or three in each cell, collateral, or rarely indefinite, attached to an axile placenta, ascending, anatropous; micropyle inferior; raphe ventral. Fruit baccate, crowned with the truncate persistent calyx-tube, two to four-seeded. Seed subglobose, destitute of albumen; testa membranaceous, shining. Embryo filling the cavity of the seed; cotyledons foliaceous, contortuplicate; radicle elongated, incurved.

Calyptranthes is confined to tropical America, where seventy or eighty species,[1] distributed from the shores of Lake Worth in southern Florida to Brazil and Peru, are distinguished.

The genus possesses few useful properties. The flower-buds and fruit are aromatic and astringent, and are occasionally used in condiments and as stimulants and digestives,[2] especially those of the Brazilian *C. aromatica*[3] and *C. obscura*,[4] of the Mexican *C. Schlechtendaliana*[5] and *C. Schiedeana*,[6] and of the Peruvian *C. paniculata*.[7]

The name of the genus, from *καλύπτρα* and *ἄνθη*, refers to the peculiar lid-like limb which closes the calyx before the opening of the flower. One species inhabits Florida.

[1] Swartz, *Prodr.* 79; *Fl. Ind. Occ.* ii. 917. — Willdenow, *Spec.* ii. 974. — Ruiz & Pavon, *Syst.* 130. — De Candolle, *Prodr.* iii. 256. — Berg, *Linnæa*, xxvii. 18; *Martius Fl. Brasil.* xiv. pt. i. 38. — Grisebach, *Fl. Brit. W. Ind.* 232; *Cat. Pl. Cub.* 85. — Hemsley, *Bot. Biol. Am. Cent.* i. 408.

[2] Rosenthal, *Syn. Pl. Diaphor.* 924. — Baillon, *Hist. Pl.* vi. 340.

[3] St. Hilaire, *Pl. Usuelles Brasil.* t. 14 (1824). — De Candolle, *l. c.* — Berg, *l. c.* 19; *l. c.* 38.

[4] De Candolle, *l. c.* 257 (1828). — Berg, *l. c.* 31; *l. c.* 542, 627.

[5] Berg, *Linnæa*, xxvii. 29 (1854). — Hemsley, *l. c.* 409.

[6] Berg, *l. c.* 28 (1854). — Hemsley, *l. c.* 409.

[7] Ruiz & Pavon, *Prodr.* 74, t. 13 (1794); *Syst.* 131. — De Candolle, *l. c.* 258. — Berg, *l. c.* 20.

CALYPTRANTHES CHYTRACULIA.

PETALS 0; ovules 2 in each cell. Branchlets wing-angled.

Calyptranthes Chytraculia, Swartz, *Prodr.* 79 (1788); *Fl. Ind. Occ.* ii. 921. — Willdenow, *Spec.* ii. 975. — Persoon, *Syn.* ii. 32. — Sprengel, *Syst.* ii. 499. — De Candolle, *Prodr.* iii. 257. — Don, *Gen. Syst.* ii. 847. — Nuttall, *Sylva*, i. 101, t. 26. — Dietrich, *Syn.* iii. 120. — Berg, *Linnæa*, xxvii. 26. — Chapman, *Fl.* 131. — Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix. 88.

Myrtus Chytraculia, Linnæus, *Amœn.* v. 398 (1760). — Swartz, *Obs.* 202.

Eugenia pallens, Poiret, *Lam. Dict.* Suppl. iii. 122 (1813).

A slender tree, in Florida sometimes twenty to twenty-five feet in height, with a trunk three or four inches in diameter, and a narrow head. The bark of the trunk is one eighth of an inch thick, with a generally smooth, light gray, or almost white surface, occasionally separating into irregular plate-like scales. The branchlets, when they first appear, are slender, wing-angled between the nodes, and coated, like the branches of the flower-clusters, the bracts, and the flower-buds, with short rufous silky tomentum; in their second or third year they become terete, thicken at the nodes, and are covered with light gray bark tinged with red and broken into small thin scales. The leaves are oblong or ovate-oblong, elongated and rounded or acute at the apex, and gradually contracted at the base into long petioles; they are pellucid-punctate on the upper surface, marked with dark glands on the lower, and are at first pink or light red and covered with pale silky hairs, and at maturity are coriaceous, dark green and lustrous above, coated with pale pubescence below, two and a half to three inches long and one half to three quarters of an inch broad, with slightly thickened revolute margins, broad midribs orange-colored beneath and deeply impressed on the upper surface, slender veins arcuate and united near the margins, and petioles varying from one third to one half of an inch in length. The flower-clusters are subterminal and axillary, long-stemmed, and from two and a half to three inches in length and breadth, with slender divaricate branches, the flowers of the ultimate divisions being in threes. The flowers are sessile, apetalous, an eighth of an inch long, and covered with rufous pubescence on the outer surface of the calyx-limb. The fruit is oblong or nearly globose, dark reddish brown, and puberulous, with thin dry flesh and lustrous seeds.[1]

In Florida *Calyptranthes Chytraculia* inhabits the shores of Lake Worth, and is not uncommon on Key West and Key Largo and on the hummocks in the neighborhood of Bay Biscayne. It occurs on many of the West India islands[2] and in southern Mexico.[3]

The wood of *Calyptranthes Chytraculia* is very heavy, hard, and close-grained, with numerous

[1] Berg (*Linnæa*, xxvii. 27) proposed the following varieties: —

α. *genuina:* indumentum tomentose, ultimately silky; leaves short-petiolate, ovate, obtuse, or shortly acuminate at the base, glabrous, obscurely impressed-punctate on the upper surface; cymes two to four-branched, shorter than the leaves, subterminal.

β. *ovalis:* indumentum, scanty, velutinous; leaves short-petiolate, oval, acute at the base, obsoletely impressed-punctate on the upper surface, with very narrow veins; cymes shorter than the leaves.

γ. *trichotoma:* indumentum, silky-velutinous; leaves long-petiolate, oval-oblong or oval, acute at the base, ciliate on the margins, slightly impressed-punctate on the upper surface, densely silky-pubescent on the lower, with very thin veins; cymes ample, longer than the leaves.

δ. *pauciflora:* indumentum, silky-velutinous; leaves long-petiolate, oval-oblong, acute at the base, impressed-punctate on the upper surface, silky-pubescent on the lower, with thin veins; cymes long-pedunculate, scarcely shorter than the leaves, their branches abbreviated, few-flowered.

ε. *Zuzygium:* branches and petioles ferrugineo-silky; leaves long-petiolate, oval, acute at the base, impressed-punctate on the upper surface, glabrous, with thin veins; cymes as long as the leaves, trichotomous.

Myrtus Zuzygium, Linnæus, *Amœn.* v. 398 (1760).

Calyptranthes Zuzygium, Swartz, *Prodr.* 79 (1788); *Fl. Ind. Occ.* ii. 919. — De Candolle, *Prodr.* iii. 257. — Grisebach, *Fl. Brit. W. Ind.* 232.

[2] Lunan, *Hort. Jam.* i. 61. — A. Richard, *Fl. Cub.* ii. 275. — Grisebach, *l. c.* 232. — Eggers, *Bull. U. S. Nat. Mus.* No. 13, 50 (*Fl. St. Croix and the Virgin Islands*).

[3] Hemsley, *Bot. Biol. Am. Cent.* i. 408.

evenly distributed rather large open ducts and many thin medullary rays. It is brown tinged with red, with lighter colored sapwood composed of thirty to forty layers of annual growth. The specific gravity of the absolutely dry wood is 0.8992, a cubic foot weighing 56.04 pounds.[1]

Calyptranthes Chytraculia was first described by Patrick Browne in the *Natural History of Jamaica*, published in 1756;[2] and in Florida was first noticed by Dr. J. L. Blodgett. According to Aiton,[3] it was introduced into English gardens in 1778.

[1] In Florida *Calyptranthes Chytraculia* grows very slowly. The trunk of this tree in the Jesup Collection of North American Woods in the American Museum of Natural History in New York is five and a half inches in diameter, and displays one hundred and thirty-six layers of annual growth.

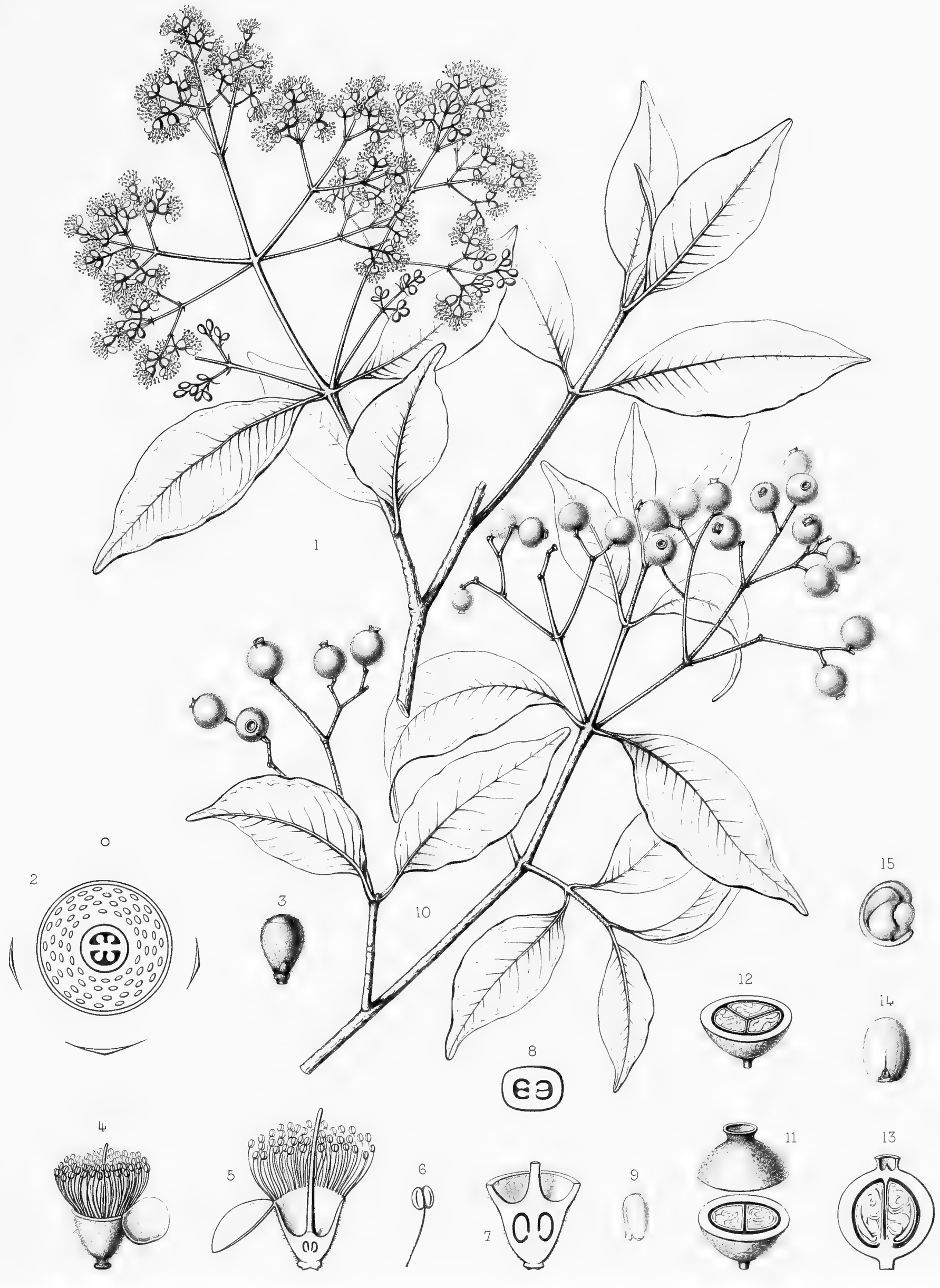
[2] *Chytraculia arborea, foliis ovatis glabris oppositis, racemis terminalibus*, 239, t. 37, f. 2.

[3] *Hort. Kew.* ed. 2, iii. 192.

EXPLANATION OF THE PLATE.

PLATE CCV. CALYPTRANTHES CHYTRACULIA.

1. A flowering branch, natural size.
2. Diagram of a flower.
3. A flower-bud, enlarged.
4. A flower, enlarged.
5. Vertical section of a flower, enlarged.
6. A stamen, enlarged.
7. Vertical section of an ovary, enlarged.
8. Cross section of an ovary, enlarged.
9. An ovule, much magnified.
10. A fruiting branch, natural size.
11. A fruit cut transversely, enlarged.
12. Cross section of a fruit, enlarged.
13. Vertical section of a fruit, enlarged.
14. A seed, enlarged.
15. An embryo, enlarged.



C.E. Faxon del. Picart fr. sc.

CALYPTRANTHES CHYTRACULIA, Sw

A. Riocreux direx.t Imp. R Taneur, Paris.

EUGENIA.

FLOWERS perfect; calyx 4 or rarely 5-lobed, the lobes imbricated in æstivation; petals usually 4, imbricated in æstivation; stamens indefinite, many-ranked; ovary inferior, 2 rarely 3-celled; ovules indefinite or 2 to 4. Fruit baccate or subdrupaceous. Leaves opposite, penniveined, coriaceous or membranaceous, destitute of stipules.

Eugenia, Linnæus, *Gen.* 139 (1737). — A. L. de Jussieu, *Gen.* 324. — Meisner, *Gen.* 109. — Endlicher, *Gen.* 1233. — Bentham & Hooker, *Gen.* i. 718. — Baillon, *Hist. Pl.* vi. 354 (excl. *Cuphœanthus*).
Caryophyllus, Linnæus, *Gen.* 154 (1737). — Adanson, *Fam. Pl.* ii. 88. — A. L. de Jussieu, *Gen.* 324. — Meisner, *Gen.* 108. — Endlicher, *Gen.* 1232.
Plinia, Linnæus, *Gen.* 155 (1737). — Adanson, *Fam. Pl.* ii. 448. — A. L. de Jussieu, *Gen.* 342.
Jambos, Burmann, *Thes. Zeylan.* 124 (1737). — Adanson, *Fam. Pl.* ii. 88.
Jambosa, Rumpf, *Herb. Amboin.* i. 121 (1741). — Meisner, *Gen.* 109. — Endlicher, *Gen.* 1233.
Catinga, Aublet, *Pl. Guian.* i. 511, t. 203 (1775).
Syzygium, Gærtner, *Fruct.* i. 166, t. 33 (1788).
Greggia, Gærtner, *Fruct.* i. 168, t. 33 (1788).
Guapurium, A. L. de Jussieu, *Gen.* 324 (1789).
Opa, Loureiro, *Fl. Cochin.* i. 308 (1790).
Rugenia, Necker, *Elem. Bot.* ii. 78 (1790).
Olynthia, Lindley, *Collect.* No. 19 (1821).
Acmena, De Candolle, *Dict. Class. Hist. Nat.* xi. 446 (1826). —Meisner, *Gen.* 108. — Endlicher, *Gen.* 1232.
Jossinia, De Candolle, *Prodr.* iii. 237 (1828). — Meisner, *Gen.* 109.
Cerocarpus, Hasskarl, *Flora*, 1842, ii. Beibl. 36.
Syllysium, Meyen & Schauer, *Nov. Act. Leop.* xix. Suppl. i. 334 (1843).
Cleistocalyx, Blume, *Mus. Bot. Lugd. Bat.* i. 84 (1849).
Gelpkea, Blume, *Mus. Bot. Lugd. Bat.* i. 88 (1849).
Strongylocalyx, Blume, *Mus. Bot. Lugd. Bat.* i. 89 (1849).
Clavimyrtus, Blume, *Mus. Bot. Lugd. Bat.* i. 113 (1849).
Microjambosa, Blume, *Mus. Bot. Lugd. Bat.* i. 117 (1849).
Macromyrtus, Miquel, *Fl. Ind. Bat.* i. 439 (1855).
Phyllocalyx, Berg, *Linnæa*, xxvii. 306 (not Grisebach, nor A. Richard) (1854).
Stenocalyx, Berg, *Linnæa*, xxvii. 309 (1854).
Myrciaria, Berg, *Linnæa*, xxvii. 320 (1854).
Siphoneugena, Berg, *Linnæa*, xxvii. 344 (1854).
Hexachlamys, Berg, *Linnæa*, xxvii. 345 (1854).

Trees or shrubs, with aromatic foliage, hard durable wood, and scaly bark. Leaves opposite, coriaceous or membranaceous, penniveined, destitute of stipules. Flowers often large and conspicuous, white, rose, or rarely straw-colored, bibracteolate. Inflorescence centripetal, the pedicels one-flowered, opposite, solitary in the axils of the leaves, fascicled or collected in short racemes; or centrifugal, the flowers in dense terminal cymes, or in terminal or lateral trichotomous panicles. Bracts and bractlets usually minute, caducous, occasionally foliaceous and persistent. Calyx-tube globose-ovoid, turbinate or elongated, sometimes angled or winged, not at all or more or less produced above the ovary, the limb four or rarely five-lobed, large, or minute and scarcely developed above the truncate margin of the tube. Petals inserted on the slightly thickened margin of the disk lining the calyx-tube, four or very rarely five or indefinite, free and spreading or more or less connivent, or connate and deciduous in a single piece, or wanting. Stamens indefinite, in many ranks, free or obscurely collected into four clusters by a slight union of their bases in the bud; filaments filiform, incurved in the bud; anthers versatile, introrse, attached on the back below the middle, two-celled, the cells usually parallel or rarely spreading, opening longitudinally. Ovary two, rarely three-celled; style simple, filiform, crowned with a minute capitate stigma; ovules many in each cell or two to four, attached to a central placenta, semi-anatropous; raphe ventral; micropyle superior. Fruit crowned with the persistent calyx-tube, baccate, juicy, sometimes almost drupaceous, or dry with a fibrous outer coat. Seeds one to four, globose or variously flattened by mutual pressure; testa membranaceous or cartilaginous, exalbuminous. Embryo

thick and fleshy; cotyledons thick, more or less conferruminate into a homogeneous mass; radicle very short, turned towards the hilum.

Eugenia, to which as now enlarged more than seven hundred species have been referred, and which, according to the best authorities, contains about five hundred species, is represented in North America by five species of southern Florida, three of which are small trees and one is a low shrub.[1] The genus appears in all tropical and semitropical regions, abounding in the tropics of America[2] and Asia,[3] and being less common in tropical Africa,[4] Australia,[5] and the Pacific islands.[6]

Several species are valued for their stimulant and digestive properties;[7] some produce useful timber[8] or edible fruit, and others are cultivated for the beauty of their flowers or foliage.[9] The most useful species of the genus are *Eugenia aromatica*,[10] which furnishes the cloves of commerce,[11]

[1] *Eugenia longipes*, Berg, *Linnæa*, xxvii. 150 (1854). — Chapman, *Fl.* ed. 2, Suppl. 620. — Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix. 89.

[2] Berg, *Martius Fl. Brasil.* xiv. pt. i. 214. — Grisebach, *Fl. Brit. W. Ind.* 235 (Caryophyllus, Syzygium, and Jambosa), 236 (Eugenia).

[3] Miquel, *Fl. Ind. Bat.* i. 407 (Jambosa), 440 (Eugenia), 446 (Syzygium), 462 (Caryophyllus). — Thwaites, *Enum. Pl. Zeylan.* 114 (Eugenia), 115 (Jambosa), 116 (Syzygium). — Hooker f. *Fl. Brit. Ind.* ii. 470. — Forbes & Hemsley, *Jour. Linn. Soc.* xxiii. 297.

[4] A. Richard, *Fl. Abyss.* i. 284 (Syzygium). — Harvey & Sonder, *Fl. Cap.* ii. 521 (Syzygium, Eugenia). — Oliver, *Fl. Trop. Afr.* ii. 436.

[5] Bentham, *Fl. Austral.* iii. 280.

[6] Gray, *Bot. Wilkes Explor. Exped.* 510.

[7] Rosenthal, *Syn. Pl. Diaphor.* 926. — Baillon, *Hist. Pl.* vi. 340.

[8] Gamble, *Man. Indian Timbers*, 190. — Maiden, *Useful Native Plants of Australia*, 530.

[9] Naudin, *Manuel de l'Acclimateur*, 277.

[10] Baillon, *l. c.* 311, f. 288, 289 (1877); *Traité Bot. Méd.* 1015, f. 2832–2834.

Caryophyllus aromaticus, Linnæus, *Spec.* 515 (1753). — De Candolle, *Prodr.* iii. 262. — Miquel, *l. c.* 462.

Eugenia caryophyllata, Thunberg, *Diss. De Caryophyllis aromaticis* (1788). — Willdenow, *Spec.* ii. pt. ii. 965.

Myrtus Caryophyllus, Sprengel, *Syst.* ii. 485 (1825).

[11] The Clove-tree, a handsome evergreen thirty or forty feet in height, is endemic in five small islands west of New Guinea, which constitute the original Molucca group, or Clove Islands. It was early carried to Amboyna, probably before the discovery of that island by the Portuguese, and is now cultivated in many of the islands of the East Indian Archipelago, in southern India, Ceylon, Mauritius, and Bourbon, in Zanzibar and Pemba off the eastern coast of Africa, and occasionally in the West Indies. Cloves, which are the dried flower-buds of this tree, were used in China during the Han dynasty (B. C. 266 to A. D. 220); they were perhaps known to the Romans as early as the first century, as Pliny's caryophyllon, a spice imported from India for the sake of its odor, may refer to them; for centuries they have been well known in Europe, and a considerable commerce in cloves was carried on by the overland Indian route until the discovery of the Spice Islands by the Portuguese at the beginning of the sixteenth century. For a century the Portuguese controlled the clove-trade, but in 1605 they were expelled from the Moluccas by the Dutch who, in order to secure a monopoly of this trade by confining it to the Amboyna group, endeavored to exterminate the Clove-tree from its native islands. They were at first so far successful that the Clove Islands no longer exported cloves; but the Dutch monopoly was broken before the end of the eighteenth century by the energy of the governor of the French islands of Mauritius and Bourbon, who succeeded in 1770 in introducing into them the Clove-tree and the Nutmeg. From Mauritius the Clove-tree was carried to Cayenne, and then to Zanzibar and other tropical countries, and now Zanzibar and Pemba produce a large part of the clove-crop of the world. (See Tessier, *Sur l'Importation du Giroflier des Moluques aux Îsles de France, de Bourbon et des Sechelles, et de ces îsles à Cayenne.*)

The Clove-tree flourishes in clayey loam and requires a good drainage, exposure to the sun, and protection from high winds. It is raised from seed or by layering the branches, which will root in six or eight months in moist ground. The seeds, which soon lose their power of germination, should be sown a foot apart in rich soil as soon as gathered and not more than two inches below the surface, when they will germinate at the end of five or six weeks. The seedlings require an abundant supply of water and protection from the sun. Usually the seedlings are not transplanted until they are three or four feet high, when they should be set in pits filled with enriched surface-soil; they require shading for two or three years, Banana-plants being often used for this purpose. The ground occupied by a Clove-tree plantation requires careful and constant cultivation in order to produce the best results; liberal dressings of manure are recommended, and in dry weather a thick mulch of litter increases the vigor of the trees.

The flower-buds are at first white, then green, and finally bright red, in which stage they are gathered. In Zanzibar this is done by hand from a movable stage, each bud being picked separately; in the East Indies the buds are gathered by hand from the lower branches and beaten with bamboo poles from the upper ones on to the ground, which is swept clean to receive them, or on to cloths stretched under the trees. The yield of flower-buds varies in different years; occasionally none are produced, and a heavy crop is gathered only at intervals of five or six years. Five or six pounds is considered an average annual crop from a tree in its prime. In Sumatra the length of life of the Clove-tree is from twenty to twenty-four years, although in Amboyna it is said that it does not begin producing until its twelfth or fifteenth year, and continues productive for nearly a hundred and fifty years. The flower-buds are dried in the sun as soon as gathered and are then ready for shipment. In some parts of the East Indies they are cured on frames over a slow fire before exposure to the sun.

Cloves contain sixteen to eighteen per cent. of essential oil, oleum caryophylli, a colorless yellow liquid with the odor and taste of cloves, and composed of a mixture of hydrocarbon and eugenol in variable proportions, caryophyllin, a considerable proportion of gum and tannic acid.

The principal consumption of cloves is in cooking; in medicine they are used to modify the action of other drugs, entering into

Eugenia Jambos,[1] the Rose Apple, a native of southeastern Asia and the Indian Archipelago, and cultivated in all tropical countries as a shade and ornamental tree and for its delicately fragrant and rather dry fruit, and *Eugenia Jambolana*,[2] a common Indian timber-tree. *Eugenia uniflora*,[3] the Surinam Cherry, a shrubby species originally from Brazil, with handsome flowers and aromatic fruit of a pleasant flavor, is often cultivated and has become naturalized in the tropics of the two worlds.[4] In tropical South America a number of species are esteemed as fruit-trees,[5] although the fruit of all the Eugenias is dry and inferior in flavor and quality to that of many other tropical trees.

The generic name[6] commemorates the interest in botany and gardening taken by Prince Eugene of Savoy, the famous Austrian general, who, after the peace of Carlowitz in 1699, devoted his leisure for several years to building the Belvedere Palace near Vienna and laying out its gardens, in which he made a collection of rare plants.

numerous preparations. The essential oil relieves toothache and forms an ingredient in various kinds of pills. Clove-stalks, the peduncles of the inflorescence, are imported from Zanzibar and used in the manufacture of mixed spices and in the adulteration of ground cloves; and the fruit of the Clove-tree, the mother-cloves of commerce, is used for the same purposes. The oil of cloves, which is obtained by distillation, is largely used in perfumery (Crawfurd, *Dictionary of the Indian Islands*, article Cloves. — Flückiger & Hanbury, *Pharmacographia*, 249. — Guibourt, *Hist. Drog.* ed. 7, iii. 271, f. 661. — Spons, *Encyclopædia of the Industrial Arts, Manufactures, and Raw Commercial Products*, ii. 1420, 1808. — Nichols, *Tropical Agriculture*, 184).

[1] Linnæus, *Spec.* 470 (1753). — Brandis, *Forest Fl. Brit. Ind.* 233. — Kurz, *Forest Fl. Brit. Burm.* i. 495. — Hooker f. *Fl. Brit. Ind.* ii. 474. — Forbes & Hemsley, *Jour. Linn. Soc.* xxiii. 297.

Jambosa vulgaris, De Candolle, *Prodr.* iii. 286 (1828). — Wight & Walker-Arnott, *Prodr. Fl. Ind.* i. 332. — Bentham, *Fl. Hongk.* 120. — *Bot. Mag.* lxi. t. 3356. — Berg, *Linnæa*, xxvii. 342.

Myrtus Jambos, Humboldt, Bonpland & Kunth, *Nov. Gen. et Spec.* vi. 144 (1823). — Kunth, *Syn. Pl. Æquin.* iii. 418. — Sprengel, *Syst.* ii. 485. — Blume, *Bijdr. Fl. Ned. Ind.* 1085.

[2] Lamarck, *Dict.* iii. 198 (1789). — Wight, *Icon.* t. 535. — Bentham, *Fl. Austral.* iii. 283. — Beddome, *Fl. Sylv. S. Ind.* i. 197, t. 197. — Brandis, *l. c.* 233, t. 30. — Kurz, *Forest Fl. Brit. Burm.* i. 485. — Hooker f. *l. c.* 499.

Calyptranthes Jambolana, Willdenow, *Spec.* ii. pt. ii. 975 (1799).

Syzygium Jambolanum, De Candolle, *l. c.* 259 (1828). — Wight & Walker-Arnott, *l. c.* 329. — Berg, *l. c.* 339.

Eugenia Moorei, F. Mueller, *Fragm. Phyt. Austral.* v. 33 (1866).

Eugenia Jambolana, the Black Plum-tree, is common in the fertile plains of India, ascending on the Himalayas to an elevation of four thousand or rarely five thousand feet; and in the Indian Archipelago, Queensland, and New South Wales it is naturalized or indigenous. It is a tall tree, often attaining the height of eighty or ninety feet, with a stout straight trunk, and in India and other tropical countries is often planted as a shade tree, for which purpose its wide-spreading branches, drooping branchlets, and crown of dense dark foliage make it valuable. It produces tough hard heavy dark-colored wood, which is used in India in building and in the manufacture of horticultural implements. The fruit, which resembles a small plum, is eaten by the natives of India and by birds, and yields a sort of vinegar. The bark is astringent and dyes brown (Balfour, *Cyclopædia of India*, ed. 3, i. 1059).

[3] Linnæus, *l. c.* 470 (1753). — Willdenow, *l. c.* 962.

Myrtus Brasiliana, Linnæus, *l. c.* 471 (1753). — Sprengel, *l. c.* 480.

Plinia rubra, Linnæus, *Mant.* 243 (1771). — Vellozo, *Fl. Flum.* v. t. 46.

Plinia pedunculata, Linnæus f. *Syst.* ed. 13, Suppl. 253 (1781). — *Bot. Mag.* xiv. t. 473.

Eugenia Michelii, Lamarck, *l. c.* 203 (1789). — De Candolle, *l. c.* 263.

Myrtus Willdenowii, Sprengel, *l. c.* (1825).

Eugenia Zeylanica, Willdenow, *l. c.* 963 (1799).

Eugenia? Willdenowii, De Candolle, *l. c.* 265 (1828).

Eugenia Parkeriana, De Candolle, *l. c.* 271 (1828).

Stenocalyx Michelii, Berg, *Martius Fl. Brasil.* xiv. pt. i. 337 (1855); *Linnæa*, xxvii. 310.

[4] Miquel, *Fl. Ind. Bat.* i. 440. — Grisebach, *Fl. Brit. W. Ind.* 239. — Hooker f. *l. c.* 505. — Lefroy, *Bull. U. S. Nat. Mus.* No. 25, 74 (*Bot. Bermuda*).

[5] Berg, *Martius Fl. Brasil.* xiv. pt. i. 627.

[6] Micheli, *Nov. Pl. Gen.* 227.

SYNOPSIS OF THE NORTH AMERICAN ARBORESCENT SPECIES.

Eueugenia: Flowers 4 rarely 5-parted; calyx campanulate, scarcely produced above the ovary; petals free and spreading; ovules numerous; pedicels short, obsolete, or elongated.

Flowers in short solitary or clustered axillary racemes.

Leaves ovate or obovate, rounded at the apex, short-petiolate . . . . . 1. E. BUXIFOLIA.

Leaves ovate, contracted at the apex into broad points, distinctly petiolate . . . . . 2. E. MONTICOLA.

Flowers in axillary fascicles.

Leaves usually broadly ovate, narrowed at the apex into short points, subcoriaceous . . . 3. E. PROCERA.

Leaves ovate-oblong, narrowed at the apex into long points, coriaceous . . . . . 4. E. GARBERI.

EUGENIA BUXIFOLIA.

Gurgeon Stopper. Spanish Stopper.

LEAVES ovate or obovate, rounded at the apex, short-petiolate.

Eugenia buxifolia, Willdenow, *Spec.* ii. pt. ii. 960 (1799). — Persoon, *Syn.* ii. 29. — De Candolle, *Prodr.* iii. 275. — Don, *Gen. Syst.* ii. 859. — Nuttall, *Sylva*, i. 108, t. 29. — Dietrich, *Syn.* iii. 62. — Chapman, *Fl.* 131. — Grisebach, *Fl. Brit. W. Ind.* 236. — Sargent, *Forest Trees N. Am. 10th Census U. S.* ix. 88. — Hitchcock, *Rep. Missouri Bot. Gard.* iv. 86.

Myrtus buxifolia, Swartz, *Prodr.* 78 (1788); *Fl. Ind. Occ.* ii. 899. — Sprengel, *Syst.* ii. 484. — **Kunth**, *Mém. Soc. Hist. Nat. Paris*, i. 325.

Myrtus axillaris, Poiret, *Lam. Dict.* iv. 412 (not Swartz) (1797).

Eugenia myrtoides, Poiret, *Lam. Dict.* Suppl. iii. 125 (1813).

Myrtus Poireti, Sprengel, *Syst.* ii. 483 (1825).

Eugenia triplinervia, γ. buxifolia, Berg, *Linnæa*, xxvii. 191 (excl. syn. *E. Monticola*) (1854).

A small shrubby tree, in Florida rarely twenty feet in height, with a short trunk occasionally a foot in diameter; or often a shrub with numerous stems. The surface of the bark of the trunk, which barely exceeds an eighth of an inch in thickness, is light brown tinged with red and is broken into small thick square scales. The branchlets are terete, slender, and coated at first with thick rufous tomentum; at the end of a few months they are ashy gray or gray tinged with red, and are often more or less twisted or contorted. The leaves are ovate or obovate, rounded at the apex, and sessile or contracted into very short thick petioles, and entire or occasionally slightly and remotely crenulate-toothed above the middle; they are an inch to an inch and a half long, half an inch broad, thick and coriaceous, dark green on the upper surface, yellow-green and marked with minute black dots on the lower, with narrow inconspicuous midribs and incurved nearly obsolete veins arcuate and united near the slightly thickened and revolute margins; in Florida they usually unfold in November and remain on the branches until the end of their second winter, often turning red or partly red before falling. The flowers, which appear in Florida from midsummer until early autumn in short rufous pubescent racemes clustered in the axils of the old leaves or often of those which have fallen, are borne on short thick pedicels and are an eighth of an inch across when expanded. The bracts are minute, lanceolate-acute, and persistent; the bractlets, which are placed immediately below the flowers, are broadly ovate-acute. The calyx is glandular-punctate, globose, ovoid, and pubescent on the outer surface, with four ovate rounded lobes much shorter than the four ovate white petals which are rounded at the apex, ciliate on the margins, and glandular-punctate. The fruit is a globose black and glandularly roughened berry crowned with the large calyx-lobes, one third of an inch in diameter, with thin aromatic flesh, and is usually one-seeded. The seed is an eighth of an inch across, with a thick pale brown lustrous cartilaginous coat and a pale olive-green embryo.

Eugenia buxifolia, which also inhabits several of the Antilles, is distributed in Florida from Cape Canaveral on the east coast to the southern keys, and from the banks of the Caloosa River on the west coast to Cape Sable. On Key West and some of the other Florida islands it is one of the most common plants, forming on the coral rock a large part of the shrubby second growth which now occupies ground from which the original forest has been removed.

The wood of *Eugenia buxifolia* is very heavy and exceedingly hard, strong, and close-grained, and contains numerous thin medullary rays; it is dark brown shaded with red, with thick lighter colored sapwood composed of fifteen or twenty layers of annual growth. The specific gravity of the absolutely dry wood is 0.9360, a cubic foot weighing 58.33 pounds. On the Florida keys it is sometimes used for fuel.

Eugenia buxifolia was discovered in San Domingo by the Swedish botanist Swartz,[1] and was first noticed in the United States on Key West by Dr. J. L. Blodgett.

[1] Olof Swartz (1760–1818) was born at Norrköping in Sweden, and at the age of eighteen was sent to the University of Upsal, where he studied natural history under the younger Linnæus. In 1783, after the preparation of his *Dissertatio de Methodo Muscorum* and his account of *Gentiana pulchella*, he left Sweden with the view of improving himself by foreign travel. Having spent a year in North America, he visited the West Indies, where he remained for two years studying the vegetation of the tropics and gathering botanical specimens, chiefly in San Domingo. In 1786 Swartz returned to Sweden by way of England, and four years later was made president of the Academy of Stockholm and a professor in the Burgian Agricultural Institution, where he devoted the remainder of his life to the study of botany and the elaboration and publication of his large West Indian collections. In his *Genera et Species Orchidearum* Swartz established upon fixed principles several new genera of orchids, adding many new tropical American species to this family, which by him was first elaborated in a comprehensive manner. He was the author of a number of classical works on the West Indian flora, in which the first descriptions of many genera and species are found. He paid particular attention to the study of cryptogamic plants, especially Mosses, and published a manual of the Swedish species in 1799. He was the author of a *Synopsis Filicum*, published in 1806, in which seven new genera are distinguished; and he is said to have discovered in the neighborhood of Stockholm alone three hundred species of Lichens new to the flora of Sweden. *Swartzia*, a genus of noble tropical American trees of the Pea family, was dedicated to him by Willdenow.

EXPLANATION OF THE PLATE.

PLATE CCVI. EUGENIA BUXIFOLIA.

1. A flowering branch, natural size.
2. Diagram of a flower.
3. A flower, enlarged.
4. Vertical section of a flower, enlarged.
5. A flower, the petals and stamens removed, enlarged.
6. A stamen, enlarged.
7. An ovule, much magnified.
8. A fruiting branch, natural size.
9. Vertical section of a fruit, enlarged.
10. A fruit cut transversely, enlarged.
11. A seed, enlarged.
12. An embryo, enlarged.

C.E. Faxon del. Picart fr. sc

EUGENIA BUXIFOLIA, Willd.

A Riocreux direx.t Imp. R. Taneur, Paris.

EUGENIA MONTICOLA.

Stopper. White Stopper.

LEAVES ovate, narrowed at the apex into broad points, distinctly petiolate.

Eugenia Monticola, De Candolle, *Prodr.* iii. 275 (1828). — **Myrtus Monticola**, Swartz, *Prodr.* 78 (1788); *Fl. Ind. Occ.* ii. 898. — Sprengel, *Syst.* ii. 484. — Don, *Gen. Syst.* ii. 859. — Dietrich, *Syn.* iii. 62. — Chapman, *Fl.* 131. — Grisebach, *Fl. Brit. W. Ind.* 236. — Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix. 89. — Hitchcock, *Rep. Missouri Bot. Gard.* iv. 86.

Eugenia triplinervia, Berg, *Linnæa*, xxvii. 190 (in part) (1854).

Eugenia axillaris, Berg, *Linnæa*, xxvii. 201 (in part) (1854).

A tree, twenty to twenty-five feet in height, with a trunk occasionally a foot in diameter; or toward the northern limit of its range in Florida a low shrub. The bark of the trunk is an eighth of an inch thick and is divided by irregular shallow fissures, the surface of the broad ridges finally separating into small thin light brown scales. The branchlets are terete, rather stout and rigid, ashy gray or gray slightly tinged with red, and often covered with small wart-like elevations. The leaves are ovate, gradually or abruptly narrowed at the apex into short wide points, and rounded and contracted at the base into broad winged petioles; they are thick and coriaceous, dark green on the upper, and paler and covered with minute black spots on the lower surface, with broad midribs deeply impressed above, and conspicuous arcuate veins united near the thickened revolute entire margins, and are an inch and a half to two inches and a half long and half an inch broad with petioles one third of an inch in length. The flowers, which appear in Florida at midsummer in short axillary racemes and are an eighth of an inch across when expanded, are borne on stout pedicels; these vary from one sixteenth to nearly one half of an inch in length and are covered with pale white hairs and furnished near the middle or toward the apex with two acute minute persistent bractlets. The calyx is broadly ovate, glandular-punctate, coated on the outer surface with pale hairs, and four-lobed, with ovate rounded lobes shorter than the four ovate glandular petals. The fruit is a black globose glandular-punctate berry usually one-seeded, half an inch in diameter and crowned with the nearly obsolete calyx-lobes. The seed is globose, with a pale brown chartaceous coat and light olive-green cotyledons. In Florida the fruits ripen in slow succession from November to April and are edible and rather juicy, with a sweet agreeable flavor.

Eugenia Monticola is not common in Florida, although it is distributed from the shores of the St. John's River in the northern part of the state to the southern islands, where it occurs occasionally on Key West, Key Largo, and on upper Metacombe and Elliott's Keys. It is an inhabitant also of several of the West Indian islands.

The wood of *Eugenia Monticola* is heavy, hard, strong, and very close-grained, with numerous thin medullary rays. It is brown often tinged with red, with thin darker colored sapwood composed of five or six layers of annual growth. The specific gravity of the absolutely dry wood is 0.9156, a cubic foot weighing 57.06 pounds.[1]

Eugenia Monticola was discovered in San Domingo by the Swedish botanist Swartz, and in Florida was first noticed on Key West by Dr. J. L. Blodgett.

[1] *Eugenia Monticola*, like the other species of this genus, grows slowly in Florida. In the Jesup Collection of North American Woods in the American Museum of Natural History, New York, are two log specimens from the Florida keys; one is six inches in diameter and shows one hundred and sixteen layers of annual growth, and the other is three inches in diameter, with ninety-five layers of annual growth.

EXPLANATION OF THE PLATE.

PLATE CCVII. EUGENIA MONTICOLA.

1. A flowering branch, natural size.
2. A flower, enlarged.
3. A fruiting branch, natural size.
4. Vertical section of a fruit, enlarged.
5. Cross section of a fruit, enlarged.
6. An embryo, enlarged.

C.E. Faxon del. Picart fr sc.

EUGENIA MONTICOLA, D C

A. Riocreux dirext. Imp. R. Taneur, Paris

EUGENIA PROCERA.

Stopper.

LEAVES usually broadly ovate, narrowed at the apex into short points, subcoriaceous.

Eugenia procera, Poiret, *Lam. Dict.* Suppl. iii. 129 (1813).— De Candolle, *Prodr.* iii. 268. — Don, *Gen. Syst.* ii. 855. — Nuttall, *Sylva*, i. 106, t. 28. — Dietrich, *Syn.* iii. 58. — Berg, *Linnæa*, xxvii. 207. — Chapman, *Fl.* 131. — Grisebach, *Fl. Brit. W. Ind.* 238. — Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix. 89 (in part).

Myrtus procera, Swartz, *Prodr.* 77 (1788); *Fl. Ind. Occ.* ii. 887. — Willdenow, *Spec.* ii. pt. ii. 968.

Eugenia Baruensis, Grisebach, *Cat. Pl. Cub.* 87 (1866) (not Jacquin).

A tree, twenty to twenty-five feet in height, with a trunk occasionally a foot in diameter. The bark of the trunk is a sixteenth of an inch thick, with a smooth light gray surface faintly tinged with red. The branchlets are slender, terete, at first light purple and covered with glaucous bloom, and ultimately ashy gray or almost white. The leaves, which unfold in Florida in May, are broadly ovate, narrowed into broad points rounded at the apex, and abruptly or gradually wedge-shaped at the base; they are thin and light red at first and at maturity are subcoriaceous, two inches to two inches and a half in length and an inch to an inch and a half in width, conspicuously marked with black dots, olive-green on the upper surface, and paler on the lower, with narrow midribs slightly impressed on the upper side, obscure arcuate veins united near the entire thickened margins, and narrow-winged petioles from one third to one half of an inch in length. The flowers, which are produced in sessile axillary many-flowered clusters and are half an inch across when expanded, appear in Florida in April and May on slender glandular pedicels from one third to two thirds of an inch long and furnished at the apex with two lanceolate acute persistent bracts ciliate on their margins. The calyx-tube is turbinate and much shorter than the limb, which is divided into four glandular narrow lobes rounded at the apex and half the length of the broadly ovate rounded glandular white petals. The fruits ripen in Florida in succession from September to November, and vary from two thirds of an inch to nearly an inch in diameter; they are usually one-seeded, crowned with the large persistent calyx-lobes, and when first fully grown are orange-colored with a bright red cheek, turning black when ripe; the flesh is thin and dry and slightly glandular-roughened on the surface. The seed is nearly globose, with a thick pale chestnut-brown lustrous coat and olive-green cotyledons.

In Florida *Eugenia procera* has been found only on Key West where it is common, and on Umbrella Key. It also inhabits San Domingo, Cuba, Jamaica, Santa Cruz, and Martinique.

The wood of *Eugenia procera* is heavy, hard, close-grained, light brown, and contains numerous thin medullary rays. The sapwood is indistinguishable from the heartwood.

In the autumn, when the branches of *Eugenia procera* are covered with its large berries, which in the same cluster are sometimes bright orange and scarlet and sometimes black, it is a handsome object and one of the most beautiful of the small trees of southern Florida. It was discovered in San Domingo by the Swedish botanist Swartz, and in the United States was first noticed by Dr. J. L. Blodgett on Key West.

EXPLANATION OF THE PLATE.

PLATE CCVIII. EUGENIA PROCERA.

1. A flowering branch, natural size.
2. A flower, enlarged.
3. Vertical section of a flower, enlarged.
4. A fruiting branch, natural size.
5. Vertical section of a fruit, enlarged.
6. An embryo, enlarged.

C.E. Faxon del. Picart fr. sc.

EUGENIA PROCERA, Poir.

A. Riocreux dirext. Imp. R. Taneur, Paris.

EUGENIA GARBERI.

Red Stopper.

LEAVES ovate-oblong, contracted at the apex into long points, coriaceous.

Eugenia Garberi, Sargent, *Garden and Forest*, ii. 28, f. 87 (1889).

Eugenia procera, Sargent, *Forest Trees N. Am. 10th Census U. S.* ix. 89 (in part) (1884).

A tree, fifty to sixty feet in height, with a straight trunk eighteen to twenty inches in diameter, and stout upright branches which form a narrow compact head. The bark of the trunk is an eighth of an inch thick and, like that of the principal branches, is bright cinnamon-red and separates freely into thin small scales. The branchlets are slender, terete, and covered with smooth ashy gray bark. The leaves are ovate-oblong, abruptly or gradually contracted into long narrow points rounded or acute at the apex, and wedge-shaped or occasionally rounded at the base, with thickened revolute entire margins; as they unfold they are thin and light red, and at maturity are dark green and very lustrous on the upper surface, paler and marked with minute black dots on the lower, an inch and a half to two inches long, and one third to two thirds of an inch broad, with stout petioles a quarter of an inch in length and thick orange-colored midribs barely impressed on the upper side, primary veins arcuate and united into a conspicuous marginal line, and prominent reticulated veinlets. The minute flowers, which are barely an eighth of an inch across when expanded, appear in Florida in September in many-flowered axillary clusters on slender pedicels which vary from one quarter to one half of an inch in length, and are furnished near the apex with two minute acute bractlets. The calyx is narrowly obovate and glandular-punctate, with four ovate acute lobes much shorter than the four broadly ovate rounded white petals. The fruit, which ripens in March and April, is a quarter to a third of an inch long, bright scarlet, subglobose or obovate, crowned with the conspicuous lobes of the calyx, glandular-roughened, and usually solitary and one-seeded, with thin dry flesh. The seed is nearly globose, with a thin crustaceous light brown lustrous coat and an olive-green embryo.

Eugenia Garberi occupies a rich hummock which, about three quarters of a mile east of the mouth of the Miami River, rises above the level sandy plain that separates Bay Biscayne in southeastern Florida from the Atlantic Ocean. Here it grows in considerable numbers in company with the Mastic, the Ironwood, the Gumbo Limbo, the Calabash, the Pigeon Plum, and other tropical trees, and with the Live Oak, the Red Mulberry, the Palmetto, and the Pine, in a grove which is one of the most interesting in the United States from the commingling of tropical trees with those which belong in a temperate region. *Eugenia Garberi* grows also on Old Rhodes and on Elliott's Key in Florida, on the island of New Providence, one of the Bahama group,[1] and in Antigua.[2]

The wood of *Eugenia Garberi* is very heavy, exceedingly hard, strong, and close-grained, with numerous obscure medullary rays; it is bright red-brown, with thick darker colored sapwood composed of fifty or sixty layers of annual growth. The specific gravity of the absolutely dry wood is 0.9453, a cubic foot weighing 58.91 pounds.

Eugenia Garberi was first collected in Florida near the Miami River by Dr. A. P. Garber.[3] The lustre of its brilliant and abundant foliage, the deep rich color of its bark, and the handsome shape of its head, make this tree an attractive object; no other tree of the Myrtle family indigenous in North America equals it in size, and few of the southern Florida trees surpass it in beauty.

[1] Bruce, *Herb. Kew.*

[2] Nicholson, *Herb. Kew.*

[3] See i. 65.

EXPLANATION OF THE PLATE.

PLATE CCIX. EUGENIA GARBERI.

1. A flowering branch, natural size.
2. A flower, enlarged.
3. Vertical section of a flower, enlarged.
4. A stamen, enlarged.
5. Cross section of an ovary, enlarged.
6. A fruiting branch, natural size.
7. Vertical section of a fruit, enlarged.
8. A seed, enlarged.

C.E. Faxon del. Picart fr. sc.

EUGENIA GARBERI, Sarg.

A. Riocreux direx.t Imp. R. Taneur, Paris.

CEREUS.

FLOWERS perfect; calyx elongated, the lobes numerous, imbricated in many series; petals numerous, imbricated in æstivation; stamens indefinite, inserted in the tube of the calyx; ovary inferior, 1-celled, many-ovuled. Fruit baccate, many-seeded.

Cereus, Haworth, *Syn. Pl. Succ.* 178 (1812). — Meisner, *Gen.* 128. — Endlicher, *Gen.* 944. — Miquel, *Bull. Sci. Phys. et Nat. Néerl.* 1839, 110. — Bentham & Hooker, *Gen.* i. 849. — Baillon, *Hist. Pl.* ix. 31.

Echinopsis, Zuccarini, *Abhand. Akad. Münch.* ii. 675 (1837). — Miquel, *Bull. Sci. Phys. et Nat. Néerl.* 1839, 109.

Cephalocereus, Pfeiffer, *Otto & Dietrich Gartenz.* 142 (1838).

Cephalophorus, Lemaire, *Cact. Hort. Monvill.* 33 (1838).

Pilocereus, Lemaire, *Cact. Gen. et Spec. Nov.* 7 (1839).

Echinonyctanthus, Lemaire, *Cact. Gen. et Spec. Nov.* 10 (1839).

Echinocereus, Engelmann, *Wislizenus Memoir of a Tour to Northern Mexico* (*Senate Doc.* Bot. Appx.), 91 (1848).

Spiny leafless trees or shrubs, with copious watery juice, the stems sometimes columnar and six to twenty-ribbed, sometimes cylindrical, erect and slightly many-ribbed, sometimes remotely jointed, more or less three to seven-angled and spreading or climbing, sometimes cylindrical, weak, remotely jointed and eight to twelve-ribbed, and sometimes short, globular or oblong, many-ribbed, and clustered or branched from the base. Buds on the back of the ridges, springing from the axils of latent leaves, geminate, superposed, the upper producing a branch or flower, the lower arrested and developed into a cluster of spines surrounded by an elevated cushion or areola of chaffy tomentose scales. Flowers lateral, diurnal or nocturnal, large and showy, often fragrant. Lobes of the calyx spirally imbricated in many ranks, forming a long and slender or short or subglobose nectariferous tube, those of the exterior ranks adnate to the ovary, scale-like, only their tips free with a tuft of hairs and sometimes a cluster of spines in their axils, those of the interior ranks free, elongated, green, yellow, or bright-colored. Petals cohering by their bases with the top of the calyx-tube, larger than its interior lobes, spreading, recurved, white, red, or crimson. Stamens numerous, in two or many ranks; filaments filiform, adnate by the base to the tube of the calyx, those of the interior ranks free, the exterior united into a tube; anthers oblong, minute, attached on the back below the middle, introrse, two-celled, the cells opening longitudinally. Ovary inferior, one-celled; style elongated, filiform, terminal, divided into numerous radiating linear branches stigmatic on the inner face; ovules indefinite, horizontal, anatropous, inserted on numerous parietal placentæ; funiculi long and slender, becoming thick and juicy in the fruit. Fruit baccate, squamate, or spinescent, many-seeded, often edible. Seeds destitute of albumen, subglobose and tuberculate, or obovate smooth or pitted. Embryo straight; cotyledons abbreviated or foliaceous, usually hamate; radicle conical, turned towards the hilum.[1]

[1] The following sections of the genus are now usually recognized: —

ECHINOCEREUS. Stems short, usually subglobose, branched from the base; calyx-tube abbreviated, subcampanulate; ovary aculeate; stigmas green; seed tuberculate; cotyledons suberect.

EUCEREUS. Stems long; calyx-tube elongated, usually furnished with slender hair-like spines; stigmas pale; seed smooth or rarely rugose; embryo hooked at the apex.

LEPIDOCEREUS. Stems elongated; calyx-tube short, many-lobed, covered like the fruit with scales; seeds smooth; embryo hooked at the apex.

PILOCEREUS. Stems elongated; calyx-tube short, few-lobed, covered with scales; stigmas pale; seed smooth; embryo hooked at the apex.

ECHINOPSIS. Stem depressed, ribbed, globose or cylindrical; calyx-tube elongated, pulvilligerous, many-lobed; ovaries bristly, covered with scales; cotyledons small, connate.

About two hundred species of Cereus are now recognized;[1] they inhabit the dry southwestern region of North America,[2] the West Indies,[3] tropical South America,[4] and the Galapagos Islands.[5] At least four species with erect columnar stout stems may properly be considered trees; these are *Cereus giganteus*, the tallest member of the Cactus family and an inhabitant of the arid deserts of the southwestern territories of the United States and of Sonora; *Cereus Pringlei*,[6] a plant of Lower California, the islands of the Bay of California, and Sonora, which produces thicker trunks than any other Cactus now known; *Cereus Pecten-aboriginum*[7] of the same regions; and *Cereus Peruvianus*,[8] which in the temperate arid parts of Peru rises to a height of forty or fifty feet.

The fruit of several species is edible, and that of others has reputed medicinal virtues.[9] The ribs of the woody frames of the stems of the large arborescent species are durable and are used for the rafters of houses and for fuel. Several of the species with cylindrical stems are planted in warm countries as hedges to protect cultivated fields from grazing animals, and others are everywhere popular garden plants,[10] valued for their beautiful flowers, which are sometimes nocturnal and exceedingly fragrant.

The generic name relates to the candle-like form of the stems of some of the species.

[1] Like other plants of the Cactus family, the species of Cereus are difficult to understand and limit unless studied alive, and it is not improbable that the number at present established by botanists will be reduced when they are better known.

[2] Engelmann, *Am. Jour. Sci.* ser. 2, xvii. 278; *Bot. Mex. Bound. Surv.* ii. 28. — Hemsley, *Bot. Biol. Am. Cent.* i. 540.

[3] Grisebach, *Fl. Brit. W. Ind.* 300.

[4] C. Gay, *Fl. Chil.* iii. 18. — Jameson, *Syn. Pl. Æquator.* i. 260.

[5] Hooker f. *Trans. Linn. Soc.* xx. 223. — Andersson, *Stockh. Acad. Handl.* 1853, 95 (*Om Galapagos-Öarnes Veg.*).

[6] Watson, *Proc. Am. Acad.* xx. 368 (1885). — Sargent, *Garden and Forest*, ii. 64, f. 92. — Brandegee, *Proc. Cal. Acad.* ser. 2, ii. 162 (*Pl. Baja Cal.*). — Vasey & Rose, *Contrib. U. S. Nat. Herb.* i. 79.

The little island of San Pedro Marten in the Gulf of California is covered with a forest of large trees of this Cactus, called Carden by the Mexican Indians, who grind the seeds and pulp into flour which they wrap between corn-husks and boil into cakes. The ribs of the stems are used on the island for door-posts and the rafters of houses, and supply the inhabitants with their only fuel.

[7] Watson, *l. c.* xxi. 429 (1886). — Brandegee, *Proc. Cal. Acad.* ser. 2, iii. 141. — Vasey & Rose, *l. c.* 89.

The bristly covering of the fruit of this tree, which produces trunks twenty to thirty feet high and three feet in diameter, is used as hair-brushes by the Mexican Indians, who also grind the seeds and mix them with their meal.

[8] De Candolle, *Prodr.* iii. 464 (1828).

Cactus Peruvianus, Linnæus, *Spec.* 467 (1753). — De Candolle, *Pl. Grasses*, t. 58.

Cactus hexagonus, Willdenow, *Enum.* Suppl. 32 (1813).

[9] Baillon, *Hist. Pl.* ix. 38.

[10] Nicholson, *Dict. Gard.* i. 299. — Naudin, *Manuel de l'Acclimateur*, 200.

CEREUS GIGANTEUS.

Suwarro.

FLOWERS clustered at the top of the stems; calyx-tube short, covered with scales, many-lobed. Fruit oval, bursting irregularly into three or four valves; seeds smooth; cotyledons foliaceous, hooked at the apex.

Cereus giganteus, Engelmann, *Emory's Rep.* 158 (1848); *Am. Jour. Sci.* ser. 2, xiv. 335; xvii. 231; *Proc. Am. Acad.* iii. 287; *Bot. Mex. Bound. Surv.* ii. 42, t. 61, 62; *Brewer & Watson Bot. Cal.* i. 247. — Bigelow, *Pacific R. R. Rep.* iv. 12. — Engelmann & Bigelow, *Pacific R. R. Rep.* iv. 36. — Walpers, *Ann.* v. 46. — Lemaire, *Ill. Hort.* ix. Misc. 95. — Marcou, *Jour. Hort. Soc. France*, sér. 2, iii. 676. — Hemsley, *Bot. Biol. Am. Cent.* i. 543. — James, *Am. Nat.* xv. 982, f. 3. — Sargent, *Forest Trees N. Am. 10th Census U. S.* ix. 89.

Pilocereus Engelmanni, Lemaire, *Ill. Hort.* ix. Misc. 97 (1862).

Pilocereus giganteus, Förster, *Handb. Cact.* ed. Rümpler, 662, f. 88 (1886).

A tree, fifty to sixty feet in height, with a trunk sometimes two feet in diameter, columnar, thickest below the middle and tapering gradually and slightly towards both ends, marked by transverse superficial lines into rings four to eight inches long, which represent the amount of annual longitudinal growth, and branchless or furnished above the middle with a few, usually two or three, stout alternate or sometimes opposite upright branches which are shorter but otherwise resemble the principal stem. At the base the trunk is eight to twelve-ribbed, with obtuse ribs four or five inches broad separated by wide shallow depressions; higher up the stem the ribs are somewhat triangular and rounded or obtuse on the back with deep narrow grooves between them; at the top they increase to eighteen or twenty by bifurcation or by the growth of new ribs, and are obtuse, deep, and compressed. The stem and branches are covered with a thick tough green epidermis, and consist of a fleshy covering and a circle of bundles of woody fibre which makes, with annual layers of exogenous growth, dense tough elastic columns placed opposite the depressions between the ribs and one half of an inch to three inches in diameter; they are frequently united by branches growing at irregular intervals between them, and increase in thickness towards the base, where they swell into spreading irregular knotted roots. The woody frame remains standing after the death of the plant and the decomposition of its fleshy covering; this is three to six inches thick, saturated with bitter juice, and, passing between the woody bundles, forms in the centre of the stem a pith four to six inches in diameter. The backs of the ribs, except at the base of old trees where they become worn and smooth, are set at distances of half an inch with a row of pale elevated chaffy cushions or areolæ about half an inch in width and rather more in length, from which are developed clusters of stout spines; these are straight, with dark enlarged bulbous bases, and are sulcate and angled, and pale or tinged with red; in the centre of the cluster are six stout spines; of these the lower four are horizontal or slightly inclined downward, the lowest being the longest and stoutest and sometimes an inch and a half long and one twelfth of an inch thick, while the upper two are shorter, more slender, and slightly turned upward; surrounding this central group of six is a row of shorter and thinner spreading radial spines, twelve to sixteen in number. The upper radial spines, which are sometimes accompanied by a few shorter setaceous spines, and the lower vary from one half of an inch to an inch in length, and are much shorter than the lateral radial spines which are sometimes an inch and a half long and increase in length towards the bottom of the cluster. The spine-clusters and areolæ fall together from old stems, generally the six central spines falling first, leaving the radial spines appressed on the stem. The flowers, which begin to appear on plants twelve to fifteen feet high and open from May to July, are produced in great numbers near the top of the stem, each

being surrounded on the lower side by the radial spines of the cluster above which it is developed; they are four to four and a half inches long, and two and a half inches broad when expanded. The ovary is ovoid, an inch in length, and rather shorter than the stout tube of the flower; it is covered like the base of the tube by thick imbricated green scales with small free triangular acute scarious mucronate tips furnished in their axils with short tufts of rufous hairs and occasionally with clusters of short chartaceous spines. The scale-tips lengthen above the base of the tube and gradually pass into thin oblong-ovate or obovate sepals, mucronate or rounded at the apex and closely imbricated in many ranks. The petals, which vary in number from twenty-five to thirty-five, are obovate-spatulate, obtuse, entire, thick and fleshy, creamy white, two thirds of an inch long, and much reflexed after the expansion of the flower. The stamens are exceedingly numerous, with long slender filaments and linear anthers emarginate at both ends; the filaments are united for half their length to the walls of the calyx-tube, the exterior rows being joined below into a long tube which lines its bottom, from which rises the stout columnar style surrounded at the base by a circle of oblong nectariferous glands and divided at the apex into twelve or fifteen green stigmas. The fruit ripens in August and is ovate or slightly obovate, two and a half inches long, one inch and a third broad, and covered with the remote persistent tips of the scales of the ovary; the top is truncate and covered by the depressed pale scar left by the falling of the flower. When ripe it is light red and separates irregularly into three or four fleshy valves which are one sixth of an inch thick and bright red on their inner surface, and in opening disclose the bright scarlet juicy mass of the enlarged funiculi through which are scattered innumerable seeds; these are obovate, rounded, one sixteenth of an inch long, and covered with a thick lustrous dark chestnut-brown coat. After the bursting of the fruit the juicy central mass dries and falls to the ground, the valves of the pericarp, which remains for some time longer on the stem, turning back and presenting the appearance of a star-shaped red flower.[1]

Cereus giganteus is distributed from the valley of Bill Williams River through central and southern Arizona to the valley of the San Pedro River, and southward in Sonora, scattered in considerable numbers through the crevices of low rocky hills and over the dry gravelly mesas of the desert, to which its tall sombre sentinel-like shafts, which look as if they had been cut from stone, give a peculiar and most interesting appearance.[2]

The wood of the columns is strong, very light, soft and rather coarse-grained, with a satiny surface susceptible of receiving a fine polish; it contains numerous conspicuous medullary rays and broad bands of open cells marking the inner portion of the layers of annual growth. It is light brown tinged with yellow, and when perfectly dry has a specific gravity of 0.3188, a cubic foot weighing 19.87 pounds. The columns, which are almost indestructible in contact with the ground and little affected by the atmosphere, are largely used for the rafters of adobe houses, for fencing, and by the Indians for lances, bows, etc. The pulp and seeds are devoured by birds, and are prized by the Indians,[3] who collect them with long forked sticks, and who dry and eat them or press them when fresh to obtain their thick molasses-like juice, which they preserve for winter use.

Cereus giganteus was discovered on the 1st of November, 1846, in a gorge of the Gila River near the mouth of the San Francisco in Arizona by Lieutenant-Colonel William H. Emory[4] of the

[1] The accompanying plate was engraved from drawings made by Mr. Faxon of the flowers and fruit of *Cereus giganteus* produced on the top of a tree sent to me in Brookline from Phœnix, Arizona, by Mr. Thomas H. Douglas. The top of the stem, which had been cut off two or three feet from the apex, was placed as soon as it arrived on a board in a warm dry greenhouse where the small flower-buds with which it was covered grew and opened, and afterward produced fully developed fruit with perfect seeds.

[2] Portraits of *Cereus giganteus* displaying the habit of the plant and the appearance of the country which it inhabits can be found in Ex. Doc. No. 41, 30th Congress, 1st Session (*Notes of a Military Reconnaisance from Fort Leavenworth in Missouri to San Diego in California*), opposite pp. 72, 74, 76, 78; in the frontispiece to part ii. vol. ii. *Report on the U. S. Mexican Boundary Survey* (Ex. Doc. No. 108, 34th Congress, 1st Session); in the *Treasury of Botany*, i. 256; in the *Flore des Serres*, x. opposite p. 24; xv. opposite p. 187; and in the frontispiece to vol. vi. of the *Rep. of the U. S. Geographical Surveys West of the One Hundredth Meridian*.

[3] Thurber, *Mem. Am. Acad.* n. ser. v. 305.

[4] See iv. 60.

United States army, when in command of a military reconnaisance from Fort Leavenworth in Missouri to San Diego in California;[1] and the first account of this tree was published with a portrait in the report of this expedition.[2] The Suwarro is now a familiar object to all travelers on the railroads of southern Arizona, and is occasionally cultivated in California and under glass in the northern states and in Europe.[3]

[1] Humboldt (*Essai sur la Nouvelle-Espagne*, i. 312) alludes to the occurrence of a great cylindrical Cactus which the Spanish missionaries found growing in the woods at the foot of the California Mountains. This, as Dr. Engelmann suggests, may have been *Cereus giganteus*, or it may equally well have been one of the other tall-stemmed species.

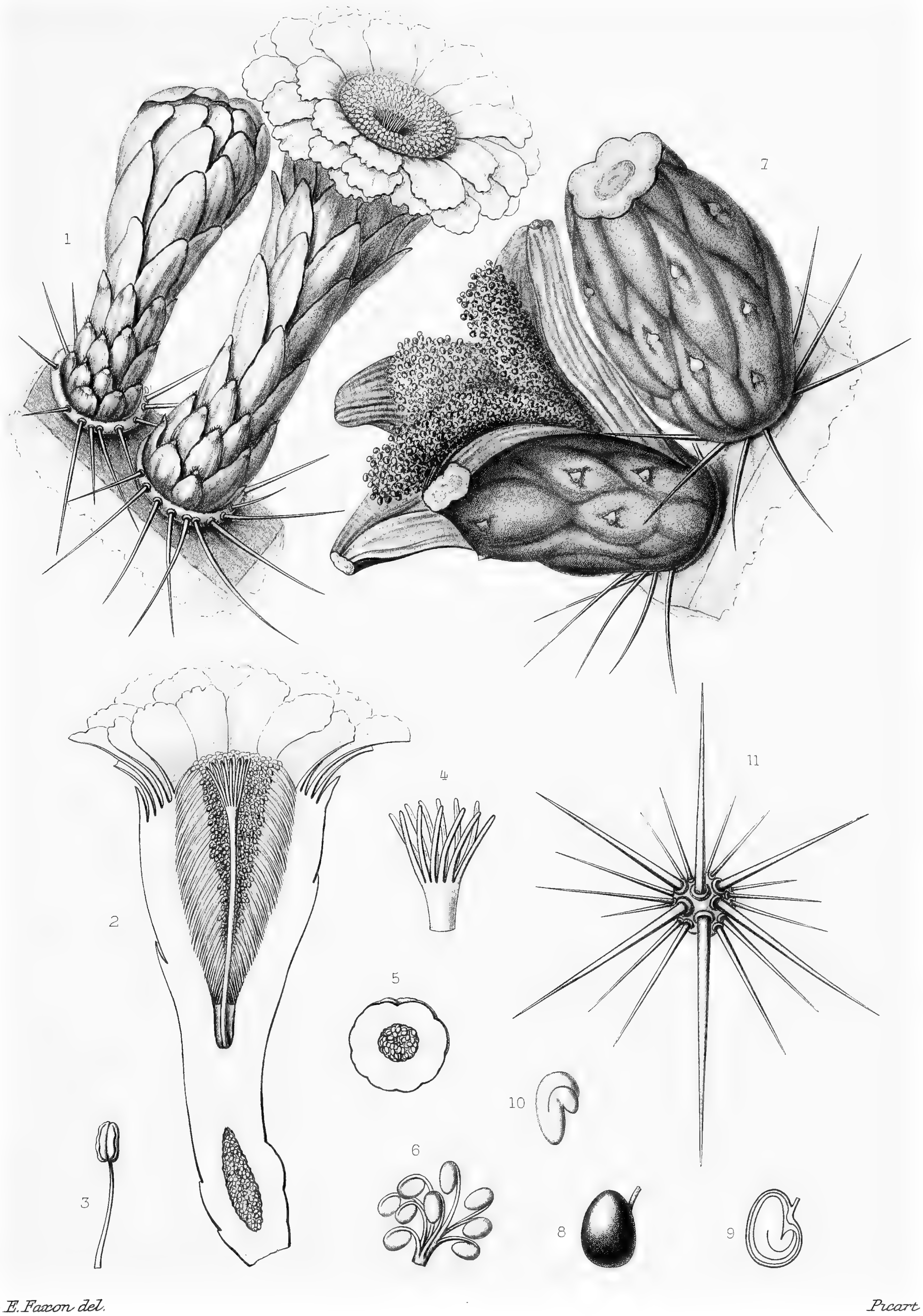
[2] Ex. Doc. No. 41, 30th Congress, 1st Session, 72.

[3] The seeds collected by Colonel Emory, and afterwards by Dr. George Thurber and Dr. C. C. Parry when connected as botanists with the United States government expedition which was intrusted with establishing the boundary line between this country and Mexico, were distributed by Dr. Engelmann among cultivators of Cactus-plants, and a number of specimens were raised. These have grown slowly, and so far as has been reported none of them have yet flowered. In Europe *Cereus giganteus* flowered for the first time in July, 1891, a large specimen which had been obtained from an American florist producing a number of flowers in the Royal Gardens at Kew in England (W. Watson, *Garden and Forest*, iv. 342. — *Bot. Mag.* cxviii. t. 7222).

EXPLANATION OF THE PLATE.

PLATE CCX. CEREUS GIGANTEUS.

1. A flower and flower-bud, natural size.
2. Vertical section of a flower, natural size.
3. A stamen, enlarged.
4. The apex of a style, enlarged.
5. Cross section of an ovary, enlarged.
6. A cluster of ovules, much magnified.
7. A closed and an open fruit, natural size.
8. A seed, enlarged.
9. Vertical section of a seed, enlarged.
10. An embryo, much magnified.
11. A cluster of spines, slightly enlarged.



C. E. Faxon del. *Picart sc.*

CEREUS GIGANTEUS, Engelm.

A. Riocreux direx.t *Imp. R. Taneur, Paris.*

ARALIA.

FLOWERS perfect, polygamo-monœcious or polygamo-diœcious; calyx-tube coherent with the ovary, the limb truncate, repand or minutely 5-toothed, the teeth valvate in æstivation; petals 5, imbricated in æstivation; stamens 5; ovary 2 to 5-celled; ovules solitary in each cell. Fruit a berry-like drupe, 2 to 5-seeded. Leaves alternate, digitate, pinnate or decompound, stipulate, deciduous.

Aralia, Linnæus, *Gen.* 88 (1737). — A. L. de Jussieu, *Gen.* 218. — Meisner, *Gen.* 152 (in part). — Endlicher, *Gen.* 794 (in part). — Decaisne & Planchon, *Rev. Hort.* 1854, 104. — Bentham & Hooker, *Gen.* i. 936.

Dimorphanthus, Miquel, *Comm. Phyt.* 95 (1840).

Aromatic spiny trees and shrubs, with stout pithy branchlets and thick fleshy roots; or bristly or glabrous perennial herbs. Leaves alternate, digitate or once or twice pinnate, the pinnæ serrulate; stipules inconspicuous, produced on the expanded and clasping base of the petiole. Bracts and bractlets minute. Flowers on slender jointed pedicels, umbellate, small, greenish white, the umbels solitary, racemose, panicled or rarely collected into compound umbels. Calyx-tube coherent with the ovary, the limb truncate, repand or minutely five-toothed. Disk epigynous, explanate, confluent with the base of the style, the margin thin and free. Petals five, inserted by their broad bases on the margin of the disk, ovate, obtuse or acute and slightly inflexed at the apex. Stamens five, inserted on the margin of the disk, alternate with the petals; filaments filiform; anthers oblong or rarely ovate, attached on the back, introrse, two-celled, the cells opening longitudinally. Ovary two to five-celled; styles two to five, in the fertile flower distinct and erect or slightly united at the base, spreading and incurved above the middle, or incurved from the base and sometimes inflexed at the apex, crowned with the large capitate stigmas; in the sterile flower short and united; ovules solitary, suspended from the apex of the cell, anatropous; raphe ventral, the micropyle superior. Fruit laterally compressed or three to five-angled, crowned with the remnants of the styles; exocarp fleshy; nutlets two to five, orbicular, ovate or oblong, compressed, crustaceous or bony, one-seeded. Seed compressed; testa thin, adnate to the thick fleshy albumen. Embryo minute, next the hilum; cotyledons ovate or oblong, as long as the straight radicle or barely longer.[1]

Aralia, as the genus is now limited, consists of about thirty North American and Asiatic species. In Asia it is common in the eastern and southern parts of the continent from Manchuria to northern India, Japan, and the islands of the Malay Archipelago. In eastern North America seven species,[2] all herbs with the exception of *Aralia spinosa*, a small tree, are distributed from Canada to New Mexico;[3] one herbaceous species grows on the mountains of California,[4] and one or two others in Mexico.[5] In

[1] The genus is conveniently divided into two sections: —

EUARALIA. Stems woody or herbaceous; leaves pinnate or decompound; flowers polygamo-monœcious or perfect; styles usually five.

GINSENG. Stems herbaceous; leaves digitate; flowers polygamo-diœcious; styles two or rarely three.

[2] Torrey & Gray, *Fl. N. Am.* i. 646. — Watson & Coulter, *Gray's Man.* ed. 6, 212.

[3] *Aralia humilis*, Cavanilles, *Icon.* iv. 7, t. 313 (1797). — De Candolle, *Prodr.* iv. 258. — Gray, *Smithsonian Contrib.* v. 65 (*Pl. Wright.* ii.).

[4] *Aralia Californica*, Watson, *Proc. Am. Acad.* xi. 144 (1876). — Brewer & Watson, *Bot. Cal.* i. 273.

Aralia racemosa, Torrey, *Pacific R. R. Rep.* iv. 94 (1856) (not Linnæus).

Aralia racemosa, var. *occidentalis*, Torrey, *Bot. Wilkes Explor. Exped.* 325 (1874).

[5] Hemsley, *Bot. Biol. Am. Cent.* i. 571. — Brandegee, *Proc. Cal. Acad.* ser. 2, ii. 165, t. 8 (*Pl. Baja Cal.*).

Asia *Aralia spinosa* in slightly modified forms appears in Manchuria, Japan, and the Philippine Islands;[1] and a second American species, *Aralia quinquefolia*, is also found in Manchuria. Japan possesses one endemic herbaceous species, and China[2] at least two; in the Malay Archipelago the largest number of arborescent and shrubby forms are collected,[3] and in India the two sections of the genus are represented by eight species.[4]

Aralia has few useful properties. In China ginseng, the root of *Aralia quinquefolia*,[5] is prized in medicine, and in Japan the roots and young shoots of *Aralia cordata*[6] are eaten as vegetables. The roots of the American *Aralia spinosa*, *Aralia racemosa*,[7] *Aralia nudicaulis*,[8] and *Aralia hispida*[9] are sometimes used in domestic practice as gentle stimulants and aperitives, chiefly in the treatment of rheumatism and syphilitic symptoms.[10]

The generic name is of obscure and doubtful meaning.

[1] *Aralia hypoleuca*, Presl, *Epimel. Bot.* 250 (1849). — Walpers, *Ann.* ii. 724.

[2] Forbes & Hemsley, *Jour. Linn. Soc.* xxiii. 337.

[3] Miquel, *Fl. Ind. Bat.* i. 749.

[4] Hooker f. *Fl. Brit. Ind.* ii. 721.

[5] Decaisne & Planchon, *Rev. Hort.* 1854, 105. — Gray, *Mem. Am. Acad.* n. ser. vi. 391. — Forbes & Hemsley, *l. c.* 338. — Watson & Coulter, *Gray's Man.* ed. 6, 213.

Panax quinquefolium, Linnæus, *Spec.* 1058 (1753). — De Candolle, *Prodr.* iv. 252. — Seemann, *Jour. Bot.* vi. 54.

Panax Americanum, Rafinesque, *New Fl.* iv. 58 (1836).

Panax Ginseng, C. A. Meyer, *Bull. Cl. Phys.-Math. Acad. Sci. St. Pétersbourg*, i. 340 (1843). — Seemann, *l. c.*

Ginseng quinquefolium, Wood, *Bot. and Fl.* 142 (1870).

In China from the earliest historic times the roots of *Aralia quinquefolia* have enjoyed the reputation of possessing marvelous medical virtues, and fabulous prices are paid for the wild Manchurian roots which are more esteemed than those of cultivated or of American plants, and are now almost entirely consumed in the Imperial household. The root is fleshy, spindle-shaped, with two or three terminal divisions, from one to four inches long, semitransparent and yellowish, with a sweet mucilaginous flavor. In China the drug prepared from the root of the Ginseng, which apparently possesses no active properties, is prescribed for nearly every form of human disease, and as a tonic and stimulant it is considered invaluable (Raynal, *Histoire Philosophique et Politique des Établissemens & du Commerce des Européens dans les deux Indes*, ii. 210. — Jartoux, *Lettres Édifiantes et Curieuses* (ed. Toulouse), xviii. 97, t. — Seemann, *l. c.* ii. 320. — Smith, *Chinese Mat. Med.* 103).

The extinction of the Manchurian supply led to the importation of the American root, and for more than a century immense quantities of wild American Ginseng-roots have been sent to China from the eastern United States, where the plant has become rare and is in danger of extermination. (See Lafitau, *Mémoire concernant la précieuse plante du Gin-seng de Tartarie, découverte en Canada.* — Michaux f. *Voyage à l'ouest des Monts Alléghanys*, 182. — Rafinesque, *Med. Fl.* ii. 53. — W. P. C. Barton, *Med. Bot.* ii. 193, t. 45. — Woodville, *Med. Bot.* ii. 270, t. 99.) For centuries the Asiatic Ginseng, which was first known to Europeans in Japan, has been cultivated on a large scale in that country (Kaempfer, *Amœn. Exot.* 826. — Rein, *The Industries of Japan*, 136); in some parts of Corea it constitutes the most important farm crop (Aston, *Pharmaceutical Journal and Transactions*, 1885, 732), and recently attempts have been made to cultivate it in the northern United States (Stanton, *Garden and Forest*, v. 223. — *Kew Bull.* 1893, 71, t.).

[6] Thunberg, *Fl. Jap.* 127 (1784). — Miquel, *Ann. Mus. Lugd. Bat.* i. 9. — Franchet & Savatier, *Enum. Pl. Jap.* i. 191.

Aralia edulis, Siebold & Zuccarini, *Fl. Jap.* i. 57, t. 25 (1835).

[7] Linnæus, *l. c.* 273 (1753). — Chapman, *Fl.* 166. — Watson & Coulter, *l. c.*

[8] Linnæus, *l. c.* 274 (1753). — Chapman, *l. c.* — Watson & Coulter, *l. c.*

[9] Ventenat, *Jard. Cels*, 41, t. 41 (1800). — Chapman, *l. c.* — Watson & Coulter, *l. c.*

[10] Porcher, *Resources of Southern Fields and Forests*, 51. — Johnson, *Man. Med. Bot. N. Am.* 156. — *U. S. Dispens.* ed. 16, 1714.

ARALIA SPINOSA.

Hercules' Club.

FLOWERS perfect or polygamo-monœcious, in large compound racemose panicles. Leaves ample, twice pinnate.

Aralia spinosa, Linnæus, *Spec.* 273 (1753). — Fabricius, *Enum. Pl. Helm.* ed. 2, 405. — Crantz, *Umbell.* 123. — Miller, *Dict.* ed. 8, No. 3. — Du Roi, *Harbk. Baumz.* i. 63. — Lamarck, *Dict.* i. 223. — Marshall, *Arbust. Am.* 11. — Walter, *Fl. Car.* 117. — Schmidt, *Oestr. Baumz.* ii. 52, t. 102, 103. — Willdenow, *Berl. Baumz.* 23; *Spec.* i. pt. ii. 1520; *Enum.* 332. — Michaux, *Fl. Bor.-Am.* i. 186. — Persoon, *Syn.* i. 332. — Pursh, *Fl. Am. Sept.* i. 209. — Roemer & Schultes, *Syst.* vi. 701. — Elliott, *Sk.* i. 372. — Sprengel, *Syst.* i. 951. — De Candolle, *Prodr.* iv. 259. — Don, *Gen. Syst.* iii. 389. — Spach, *Hist. Vég.* viii. 120. — Torrey & Gray, *Fl. N. Am.* i. 647. — Dietrich, *Syn.* ii. 1035. — Curtis, *Rep. Geolog. Surv. N. Car.* iii. 91. — Chapman, *Fl.* 166. — Seemann, *Jour. Bot.* vi. 135. — Koch, *Dendr.* i. 672. — Lauche, *Deutsche Dendr.* ed. 2, 503. — Watson & Coulter, *Gray's Man.* ed. 6, 213.

? **Chærophyllum arborescens**, Linnæus, *Spec.* 259 (1753). — Hill, *Veg. Syst.* vi. 55, t. 53, f. 3. — Crantz, *Umbell.* 79. — Lamarck, *Dict.* i. 684. — Willdenow, *Spec.* i. pt. ii. 1457. — Persoon, *Syn.* i. 321. — Don, *Gen. Syst.* iii. 367. — Torrey & Gray, *Fl. N. Am.* i. 638. — Dietrich, *Syn.* ii. 983.

A spiny tree, thirty to thirty-five feet in height, with a trunk six to eight inches in diameter and stout wide-spreading branches; or more often a shrub with a cluster of unbranched stems six to twenty feet tall. The bark of the trunk is dark brown, an eighth of an inch thick, and divided by wide shallow fissures into broad rounded ridges irregularly broken on the surface. The branchlets are one half to two thirds of an inch in diameter, armed like the principal branches and young trunks with stout and straight or slightly incurved orange-colored scattered prickles, and nearly encircled by the conspicuous narrow leaf-scars which are marked by a row of prominent fibro-vascular bundle-scars; the inner bark is bright green and the outer is thin, light orange-colored in the first season, lustrous and marked irregularly with oblong pale dots, and in the second year light brown. The terminal bud is conical, blunt at the apex, one half to three quarters of an inch long, and covered with thin chestnut-brown scales. The axillary buds are triangular, flattened, and about a quarter of an inch in length and breadth. The leaves, which are clustered at the top of the branches, are twice pinnate, three or four feet long, two and a half feet broad, with stout light brown petioles eighteen to twenty inches in length clasping the stem with enlarged bases, and armed with slender prickles, or occasionally unarmed;[1] the pinnæ are unequally pinnate, usually with five or six pairs of leaflets and a long-stalked terminal leaflet, and are often furnished at the base with a pinnate or simple leaflet; the ultimate divisions of the leaves are ovate-acute, dentate or crenate, wedge-shaped or more or less rounded at the base and short-stalked, with prominent midribs and reticulated veinlets; when they unfold they are lustrous, bronze green, and slightly pilose on the upper side of the midribs and on the midribs and primary veins below, and at maturity are membranaceous, dark green on the upper surface, pale on the lower, two to three inches in length, an inch and a half in breadth, and occasionally furnished with small hooked prickles on the upper side of the midribs. The acute stipules are half an inch long, and when the leaves unfold are puberulous on the back and ciliate on the margins. In the autumn the leaves turn light yellow before falling. The flowers, which appear in midsummer, are produced on long slender pubescent straw-colored pedicels in many-flowered umbels arranged in compound panicles, with light brown puberulous branches forming a terminal racemose cluster three or four feet in length which rises, solitary or two or three together, above the spreading leaves. The bracts and bractlets are lanceolate, acute, scarious,

[1] *Aralia spinosa*, β., Torrey & Gray, *Fl. N. Am.* i. 647 (1840).

and persistent. The flowers are one sixteenth of an inch long, perfect or often unisexual by the abortion of the ovary, and have acute white petals inflexed at the apex, and connivent styles. In the autumn the branches of the flower-clusters become purple. The fruit ripens in August in small quantities in proportion to the number of the flowers, which are often sterile; it is black, one eighth of an inch in diameter, globose, three to five-angled, and crowned with the blackened styles; the flesh is thin, purple, and very juicy; the nutlets are crustaceous and compressed.

Aralia spinosa is distributed from Pennsylvania, where it is common on the western slope of the Alleghany Mountains in the counties of Clearfield, Cambria, Westmoreland, and Fayette, to southern Indiana[1] and southeastern Missouri, and ranges southward to Florida, western Louisiana, and eastern Texas, growing in deep moist soil usually in the neighborhood of streams, and probably attaining its greatest size on the foothills of the Big Smoky Mountains in Tennessee. The Manchurian[2] and Japanese forms[3] are only distinguishable from the American plant by their larger wider leaflets, which are often more deeply cut, and are usually pubescent on the lower surface.

The wood of *Aralia spinosa* is close-grained, light, soft, and brittle; it contains numerous thin medullary rays and rows of open ducts marking the layers of annual growth, and is brown streaked with yellow, with lighter colored sapwood composed of two or three layers of annual growth.

The bark of the root and the berries are occasionally employed in the United States in medicine, principally in domestic practice, and are stimulant and diaphoretic; the bark of the root is emetic and cathartic, and has been found efficient in relieving rheumatism.[4]

The earliest account of *Aralia spinosa* was published in 1688,[5] and describes a plant cultivated by Bishop Compton in his garden at Fulham near London, who received it from John Banister in Virginia.

The unusual appearance of its stout-armed stems, the great size of its leaves, and the enormous clusters of flowers which appear when most trees and shrubs have passed their flowering time, have long made *Aralia spinosa* a favorite in the gardens of temperate countries,[6] where its habit and peculiar appearance are unlike those of any other hardy plant. In recent years the American plant is less frequently seen in cultivation than the hardier and more robust Manchurian form.

Aralia spinosa may be propagated from seed, or from cuttings of the fleshy roots, which soon produce vigorous plants.

[1] Ridgway, *Proc. U. S. Nat. Mus.* 1882, 67.

[2] *Aralia spinosa*, var. *Chinensis*.

Aralia Chinensis, Linnæus, *Spec.* 273 (1753). — De Candolle, *Prodr.* iv. 259. — Bentham, *Fl. Hongk.* 135. — Seemann, *Jour. Bot.* vi. 133.

Leea spinosa, Sprengel, *Syst.* i. 670 (1825).

Aralia Planchoniana, Hance, *Jour. Bot.* iv. 172 (1866).

Aralia Decaisneana, Hance, *Ann. Sci. Nat.* sér. 5, v. 215 (1866).

Aralia Mandshurica, Maximowicz & Ruprecht, *Bull. Cl. Phys.-Math. Acad. Sci. St. Pétersbourg*, xv. 134 (1857).

Dimorphanthus Mandshuricus, Maximowicz, *Prim. Fl. Amur.* 133 (1859).

Aralia spinosa, Forbes & Hemsley, *Jour. Linn. Soc.* xxiii. 338 (in part) (1886).

[3] *Aralia spinosa*, var. *elata*.

Dimorphanthus elatus, Miquel, *Comm. Phyt.* 95, t. 12 (1840). — Walpers, *Rep.* ii. 430.

Aralia canescens, Siebold & Zuccarini, *Abhand. Akad. Münch.* iv. 202 (1843).

Aralia Leroana, Koch, *Wochenschrift*, 1864, 369. — Seemann, *l. c.* 135 (excl. var. β., Torrey & Gray).

Aralia elata, Seemann, *Jour. Bot.* vi. 134 (1868).

Aralia spinosa, var. *glabrescens*, Franchet & Savatier, *l. c.* 191 (1875).

Aralia spinosa, var. *canescens*, Franchet & Savatier, *Enum. Pl. Jap.* i. 192 (1875).

In Yeso, where this form with large ovate leaflets, pale and pubescent or rarely glabrous on the lower surface, grows to the largest size, it is one of the commonest inhabitants of the forest of deciduous trees which cover the low hills, growing in rich humid soil, usually associated with White Oaks, Hornbeams, the Hop Hornbeam, Magnolias, Cercidiphyllum, Lindens, and Acanthopanax; it is also abundant on the mountain ranges of Hondo, and is always a conspicuous feature in August and September, when the flower-clusters rise above the surrounding foliage.

[4] Elliott, *Sk.* i. 373. — Rosenthal, *Syn. Pl. Diaphor.* 560. — Johnson, *Man. Med. Pl. N. Am.* 156. — *U. S. Dispens.* ed. 16, 1714.

[5] *Angelica arborescens spinosa, seu Arbor Indica Fraxini folio, cortice spinoso*, Ray, *Hist. Pl.* ii. 1798.

Christophoriana arbor aculeata Virginiensis, Plukenet, *Phyt.* t. 20; *Alm. Bot.* 98.

Angelica arborescens spinosa, seu Arbor Indica Fraxini folio, cortice spinoso, J. Commelyn, *Hort.* i. 89, t. 47.

Aralia arborescens spinosa, Vaillant, *Serm. Struct. Flor.* 43.

Aralia caule aculeato, Linnæus, *Hort. Cliff.* 113.

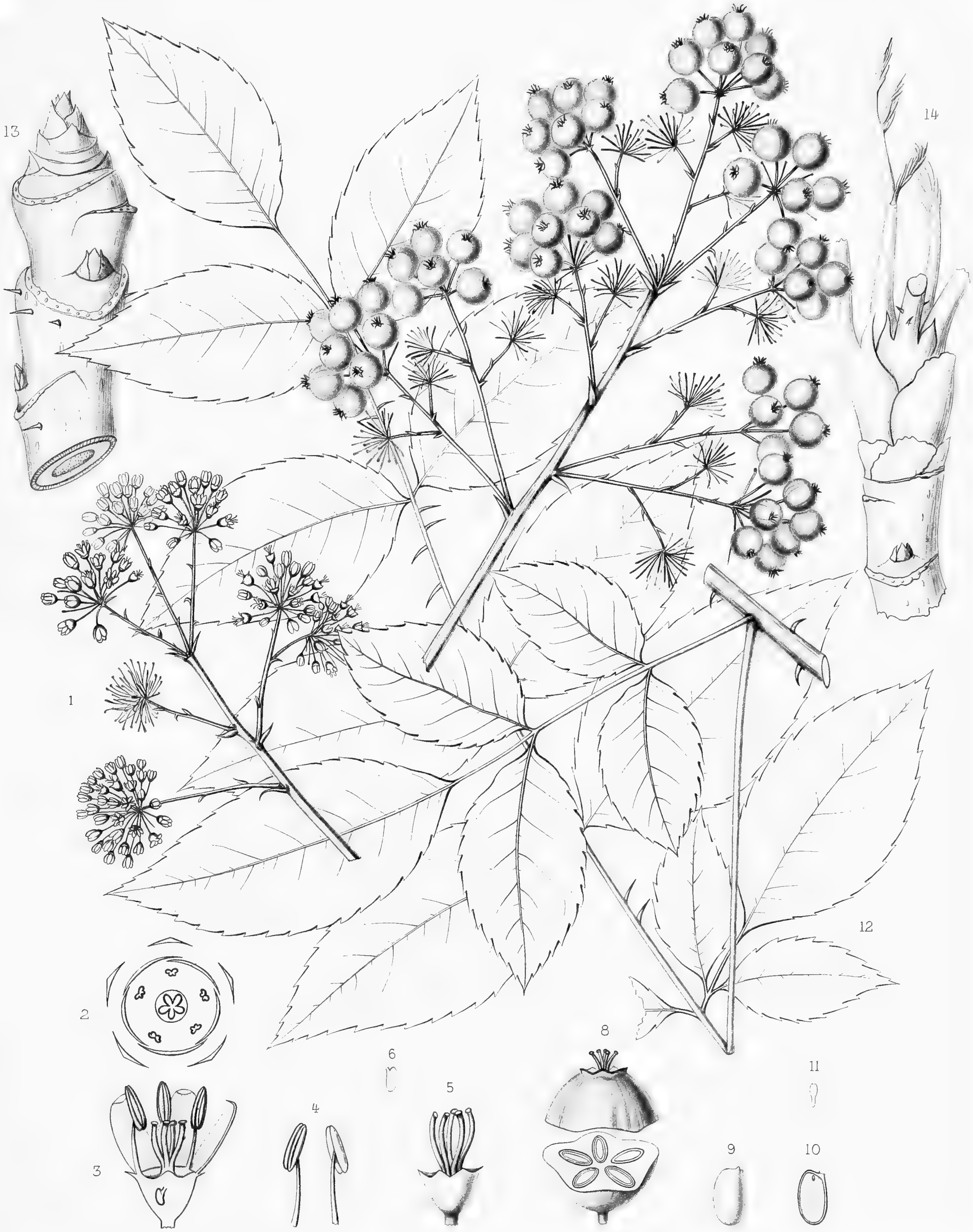
Aralia arborea aculeata, Linnæus, *Virid.* 26. — Clayton, *Fl. Virgin.* 34.

[6] Aiton, *Hort. Kew.* i. 382. — Loudon, *Arb. Brit.* ii. 999, f. 754.

EXPLANATION OF THE PLATE.

Plate CCXI. Aralia spinosa.

1. The end of a panicle of flowers, natural size.
2. Diagram of a flower.
3. Vertical section of a perfect flower, enlarged.
4. A stamen, front and rear views, enlarged.
5. A perfect flower, the petals and stamens removed, enlarged.
6. An ovule, much magnified.
7. The end of a fruiting panicle, natural size.
8. A fruit cut transversely, enlarged.
9. A seed, enlarged.
10. Vertical section of a seed, enlarged.
11. An embryo, much magnified.
12. A leaflet, natural size.
13. A winter branchlet, natural size.
14. A growing terminal bud showing stipules, natural size.



C.E. Faxon del. Lövendal sc.

ARALIA SPINOSA, L.

A. Riocreux direx.t Imp. R. Taneur, Paris.

CORNUS.

FLOWERS perfect; calyx minutely 4-toothed; petals 4, valvate in æstivation; stamens 4; ovary 2 or rarely 3-celled; ovules solitary, suspended. Fruit drupaceous, 1 or 2-seeded. Leaves opposite or rarely alternate, destitute of stipules, deciduous.

Cornus, Linnæus, *Gen.* 29 (1737). — Adanson, *Fam. Pl.* ii. 158. — A. L. de Jussieu, *Gen.* 214. — Meisner, *Gen.* 153. — Endlicher, *Gen.* 798. — Bentham & Hooker, *Gen.* i. 950. — Baillon, *Hist. Pl.* vii. 79.

Benthamia, Lindley, *Bot. Reg.* xix. t. 1579 (1833). — Meisner, *Gen.* 153. — Endlicher, *Gen.* 798.

Eukrania, Rafinesque, *Alsograph. Am.* 59 (1838).

Cynoxylon, Rafinesque, *Alsograph. Am.* 59 (1838).

Benthamidia, Spach, *Hist. Vég.* viii. 106 (1839).

Glabrous or pubescent trees and shrubs, with astringent bark, slender terete unarmed branchlets, scaly buds with accrescent scales, and fibrous roots; or herbs. Leaves opposite or rarely alternate and clustered at the ends of the branchlets, conduplicate or involute in vernation, petiolate or subsessile, entire or obscurely serrate, hirsute with tuberculate roughened hairs on the upper surface, silky-pilose and often glaucous on the lower, deciduous. Flowers small, terminal or axillary, white or greenish white, in close cymes or heads surrounded by a conspicuous involucre of four to six large petal-like scales, or yellow, precocious, umbellate, the sessile umbels surrounded by four small deciduous scales; or white or cream-color, in dichotomously branched cymes. Calyx-tube turbinate, urceolate or campanulate, terete, angled or winged, the limb minutely four-toothed. Disk epigynous, pulvinate, depressed in the centre, or obsolete. Petals four, oblong or ovate, inserted on the margin of the disk. Stamens four, exserted; filaments filiform or subulate, inserted on the margin of the disk, alternate with the petals; anthers oblong, introrse, versatile, attached on the back near the middle, two-celled, the cells opening longitudinally. Ovary inferior, two or rarely three-celled; style exserted, simple, filiform or columnar, crowned with a single capitate or truncate stigma; ovules suspended from the interior angle of the apex of the cell, solitary, anatropous; raphe dorsal; micropyle superior. Fruit drupaceous, ovoid or oblong, areolate at the apex and often crowned with the calyx-lobes or the remnants of the style, free or (Benthamia) confluent into a fleshy tuberculate syncarp; sarcocarp dry; putamen bony or crustaceous, two-celled, two or sometimes one-seeded. Seed oblong, compressed; testa membranaceous. Embryo straight or slightly incurved, as long as the copious fleshy albumen and surrounded by it; cotyledons foliaceous; radicle terete, elongated, turned towards the hilum.[1]

Cornus is widely distributed through the three continents of the northern hemisphere, and south of the equator appears in Peru with a single species.[2] In North America, where the species of Cornus are more numerous than in other parts of the world, sixteen or seventeen have been distinguished.[3] Three of these are arborescent; the other American species are large and small shrubs, and herbs of boreal

[1] The species may be conveniently grouped in the following sections.—

1. Flowers in close cymes surrounded by an involucre of four large petal-like scales. Herbaceous.

2. Flowers in close cymes surrounded by an involucre of four to six white petal-like scales. Arborescent.

3. Flowers capitate, surrounded by an involucre of four white or cream-colored petal-like scales; drupes confluent into a fleshy syncarp. Arborescent.

4. Flowers umbellate, the umbels surrounded by green deciduous scales. Arborescent or frutescent.

5. Flowers white or cream-color, in cymose panicles, ebracteolate. Arborescent or frutescent.

[2] Bentham & Hooker, *Gen.* i. 950.

[3] Coulter & Evans, *Bot. Gazette*, xv. 30, 86.

regions. The flora of Mexico contains four or five species;[1] and in Europe there are four,[2] all widely distributed in western Asia[3] also. Of the four Himalayan species, *Cornus sanguinea*[4] is also European and northern Asiatic, while *Cornus macrophylla*[5] ranges through China and Corea to Japan, and *Cornus capitata*[6] to central China. At least five species are now known to grow naturally in China,[7] although only two of them are peculiar to that empire. Five species occur in Japan,[8] where *Cornus Kousa*[9] represents the Flowering Dogwoods, and Corea possesses probably one endemic species.[10] In the early tertiary epoch arborescent species of Cornus inhabited the Arctic region; and towards the eocene period species similar to existing forms appeared in Europe.[11] In North America traces of Cornus abound in the midcontinental Laramie group.[12]

Cornus is rich in tannic acid, and the bark and occasionally the leaves and unripe fruit are used as tonics, astringents, and febrifuges.[13] The sweet cherry-like fruit of the European *Cornus mas*[14] is edible, and is used in preserves, robs, and cordials;[15] and that of several species contains considerable quantities of fatty oil.[16] The dried inner bark of the American *Cornus sericea*,[17] mixed with tobacco, was smoked with satisfaction by the Indians who inhabited the shores of the Great Lakes and the central regions of the continent.[18]

[1] Humboldt, Bonpland & Kunth, *Nov. Gen. et Spec.* iii. 430. — Kunth, *Syn. Pl. Æquin.* iii. 75. — Hemsley, *Bot. Biol. Am. Cent.* i. 575.

[2] Nyman, *Conspect. Fl. Europ.* 319.

[3] Boissier, *Fl. Orient.* ii. 1092.

[4] Linnæus, *Spec.* 117 (1753). — L'Héritier, *Cornus*, 5. — De Candolle, *Prodr.* iv. 272. — Guimpel, Willdenow & Hayne, *Abbild. Deutsch. Holz.* i. 12, t. 3. — Pallas, *Fl. Ross.* i. 117. — Ledebour, *Fl. Ross.* ii. 378. — Brandis, *Forest Fl. Brit. Ind.* 253. — Hooker f. *Fl. Brit. Ind.* ii. 744.

Cornus australis, C. A. Meyer, *Mém. Acad. Sci. St. Pétersbourg*, sér. 6, v. 211 (1849). — Boissier, *l. c.*

[5] Wallich, *Roxburgh Fl. Ind.* i. 433 (1820). — Don, *Prodr. Fl. Nepal.* 141. — De Candolle, *l. c.* — Brandis, *l. c.* 252, t. 32. — Hooker f. *l. c.* — Forbes & Hemsley, *Jour. Linn. Soc.* xxiii. 345.

Cornus brachypoda, C. A. Meyer, *l. c.* 222 (1849). — Walpers, *Ann.* ii. 725. — Franchet & Savatier, *Enum. Pl. Jap.* i. 195.

Cornus crispula, Hance, *Jour. Bot.* xix. 216 (1881).

Cornus macrophylla, which is one of the stateliest and most beautiful trees of the genus, is common in the forests of northern and central Japan, where it is usually found on moist slopes or in the neighborhood of streams, sometimes rising to the height of fifty or sixty feet and developing trunks two or three feet in diameter and broad flat heads of horizontal branches. In northern India, where it is widely distributed at elevations between three thousand and eight thousand feet above the sea, the wood is valued for the excellent charcoal for gunpowder which it yields, the fruit is eaten, and the leaves furnish fodder for goats. (See Gamble, *Man. Indian Timbers*, 212.)

[6] Wallich, *l. c.* 434 (1820); *Pl. As. Rar.* iii. 10, t. 214. — Don, *l. c.* — De Candolle, *l. c.* 273. — Hooker f. *l. c.* 745. — Forbes & Hemsley, *l. c.*

Benthamia fragifera, Lindley, *Bot. Reg.* xix. t. 1579 (1833); *Trans. Roy. Hort. Soc.* ser. 2, i. 457, t. 17. — Walpers, *Rep.* ii. 435. — Wight, *Ill. Ind. Bot.* t. 122. — *Bot. Mag.* lxxviii. t. 4641. — *Fl. des Serres*, vii. 261.

In the mountainous regions of India, where *Cornus capitata* is abundant at elevations of from thirty-five hundred to eight thousand feet, the handsome yellowish red strawberry-shaped succulent fruits formed by the coalition of the numerous pericarps are eaten raw and are made into preserves (Brandis, *l. c.* 253).

[7] Forbes & Hemsley, *l. c.* 344.

[8] Franchet & Savatier, *l. c.* 195.

[9] Miquel, *Ann. Mus. Lugd. Bat.* ii. 159 (1865). — Franchet & Savatier, *l. c.* — *The Garden*, xliii. 153, t.

Benthamia Japonica, Siebold & Zuccarini, *Fl. Jap.* i. 38, t. 16 (1835).

[10] *Cornus officinalis*, Siebold & Zuccarini, *l. c.* 100, t. 50 (1835). — Miquel, *l. c.* 160. — Franchet & Savatier, *l. c.* 196. — Forbes & Hemsley, *l. c.*

In Japan, where *Cornus officinalis* was introduced, probably from Corea, several centuries ago, it is esteemed for the tonic and astringent properties of the fruit (see Smith, *Chinese Mat. Med.* 74), and is often planted in gardens, where it appears as a bushy tree twenty or twenty-five feet in height, with the habit and general appearance of the European Cornelian Cherry, which it resembles in most of its essential characters.

[11] Saporta, *Origine Paléontologique des Arbres*, 249. — Zittel, *Handb. Palæontolog.* ii. 614.

[12] L. F. Ward, *6th Ann. Rep. U. S. Geolog. Surv.* 1884–85, 490 (*Syn. Fl. Laramie Group*).

[13] Rosenthal, *Syn. Pl. Diaphor.* 569. — Baillon, *Hist. Pl.* vii. 76; *Traité Bot. Méd.* 1072.

[14] Linnæus, *l. c.* (1753). — L'Héritier, *l. c.* 4. — Schmidt, *Oestr. Baumz.* ii. 7, t. 63. — Guimpel, Willdenow & Hayne, *l. c.* 10, t. 2. — De Candolle, *l. c.* 273. — Nyman, *l. c.* 319.

[15] Loudon, *Arb. Brit.* ii. 1016.

[16] *Jour. Chim. Méd.* ii. 350. — A. Richard, *Hist. Nat. Méd.* iii. 554.

[17] Linnæus, *Mant.* 199 (1771). — L'Héritier, *l. c.* 5, t. 2. — C. A. Meyer, *l. c.* 213. — Emerson, *Trees Mass.* ed. 2, ii. 466, t. — Coulter & Evans, *Bot. Gazette*, xv. 34. — Watson & Coulter, *Gray's Man.* ed. 6, 214.

Cornus Amomum, Du Roi, *Diss.* 7 (1771); *Harbk. Baumz.* i. 164.

? Cornus cærulea, Lamarck, *Dict.* ii. 116 (1786).

? Cornus alba, Walter, *Fl. Car.* 88 (not Linnæus) (1788).

? Cornus rubiginosa, Ehrhart, *Beitr.* iv. 15 (1789).

Cornus cyanocarpa, Moench, *Meth.* 108 (1794).

Cornus lanuginosa, Michaux, *Fl. Bor.-Am.* i. 92 (1803).

? Cornus polygama, Rafinesque, *Fl. Ludovic.* 78 (1817); *Alsograph. Am.* 61. — De Candolle, *l. c.* iv. 274. — Don, *Gen. Syst.* iii. 401.

Cornus obliqua, Rafinesque, *Ann. Nat.* 13 (1820).

[18] It is this species, which was generally known as "Kinnikin-

The wood of Cornus is hard, close-grained, and durable, and is used in turnery and for charcoal. The greatest value of Cornus, however, is for the decoration of parks and gardens; several of the species produce flowers and fruits of remarkable beauty, and others cover their branches with brilliantly colored bark.

The plants of this genus are little injured in America by the attacks of insects[1] or by fungal diseases.[2]

The generic name, from *cornu*, relates to the hardness of the wood produced by the different species.

nic," and was chiefly prized by the Indians for smoking, although in those parts of the country where it was not found they used for the same purpose the bark and leaves of several other plants. (See Parry, *Owen Rep. Geolog. Surv. Wisconsin, Iowa, and Minnesota*, 613.)

[1] The Fall Web-worm sometimes disfigures *Cornus florida*, and the larvæ of *Antispila cornifoliella*, Clemens (*Proc. Phil. Acad.* 1860, 11), mine within its leaves, and *Coleophora cornella*, Walsingham (*Trans. Ent. Soc. Lond.* 1882, 432), feeds on the leaves of *Cornus pubescens* in California. The larvæ of a Saw-fly, *Harpiphorus varianus*, Norton, destroy the foliage of several of the shrubby species of Cornus in many parts of the country (J. G. Jack, *Garden and Forest*, ii. 520). One or two species of unidentified borers injure the wood of Cornus, and a whitish Scale-insect is often abundant on the bark of plants of some species.

[2] The American arborescent species of Cornus are attacked by a number of characteristic fungi; *Myxosporium nitidum*, Berkeley & Curtis, which is common on *Cornus alternifolia*, kills the young twigs and branches, which become yellowish brown and often highly polished and spotted with the minute perithecia of this parasite. *Septoria cornicola*, Desmazière, produces numerous small white spots powdered with purple on the leaves of *Cornus florida* and *Cornus alternifolia* and on those of many shrubby species. Of all the American species, *Cornus florida* appears to be the most subject to attacks of fungi, about thirty species having been detected on this tree. Among mildews, *Microsphæra Alni*, Winter, is common on the leaves of *Cornus alternifolia* and *Cornus stolonifera*. *Phyllactinia guttata*, Léveillé, a common fungus on the Chestnut-tree, occurs also on *Cornus florida* and *Cornus stolonifera*. A sooty black fungus, *Dimerosporium pulchrum*, Saccardo, is not rare on the leaves of *Cornus paniculata* and *Cornus sericea*, but although it disfigures them it does not penetrate into the interior of the plants.

SYNOPSIS OF THE NORTH AMERICAN ARBORESCENT SPECIES.

Flowers in a dense cymose head surrounded by a conspicuous involucre of 4 to 6 petal-like scales from buds formed the previous summer.	
Heads of flower-buds inclosed by the involucre during the winter; involucral scales 4, obcordate or notched at the apex; leaves ovate or elliptical	1. C. FLORIDA.
Heads of flower-buds not inclosed by the involucre; involucral scales 4 to 6, oblong to obovate, usually acute at the apex; leaves ovate or rarely obovate	2. C. NUTTALLII.
Flowers in a cymose head without involucral scales, terminal on shoots of the year.	
Leaves mostly alternate and clustered at the ends of the branches	3. C. ALTERNIFOLIA.

CORNUS FLORIDA.

Flowering Dogwood.

HEADS of flower-buds inclosed by the involucre; involucral scales 4, obcordate or notched at the apex. Leaves ovate or elliptical.

Cornus florida, Linnæus, *Spec.* 117 (1753). — Miller, *Dict.* ed. 8, No. 3. — Du Roi, *Harbk. Baumz.* i. 167. — Wangenheim, *Beschreib. Nordam. Holz.* 111; *Nordam. Holz.* 51, t. 17, f. 41. — Moench, *Bäume Weiss.* 26. — Marshall, *Arbust. Am.* 35. — Castiglioni, *Viag. negli Stati Uniti*, ii. 225. — Lamarck, *Dict.* ii. 114; *Ill.* i. 302. — Walter, *Fl. Car.* 88. — L'Héritier, *Cornus*, 4. — Schmidt, *Oestr. Baumz.* ii. 6, t. 62. — Willdenow, *Berl. Baumz.* 73; *Spec.* i. 661; *Enum.* 164. — Abbot, *Insects of Georgia*, ii. t. 73. — *Bot. Mag.* xv. t. 526. — Michaux, *Fl. Bor.-Am.* i. 91. — Persoon, *Syn.* i. 143. — Desfontaines, *Hist. Arb.* i. 350. — Schkuhr, *Handb.* i. 82. — Titford, *Hort. Bot. Am.* 41, t. 16, f. 7. — *Nouveau Duhamel*, ii. 153. — Michaux f. *Hist. Arb. Am.* iii. 138, t. 3. — Pursh, *Fl. Am. Sept.* i. 108. — Bigelow, *Fl. Boston.* 38. — Nuttall, *Gen.* i. 98. — Roemer & Schultes, *Syst.* iii. 319. — Hayne, *Dendr. Fl.* 6. — Guimpel, Otto & Hayne, *Abbild. Holz.* 21, t. 19. — Elliott, *Sk.* i. 207. — Sprengel, *Syst.* i. 451. — Audubon, *Birds*, t. 8, 73, 122. — De Candolle, *Prodr.* iv. 273. — Hooker, *Fl. Bor.-Am.* i. 277 (in part). — Don, *Gen. Syst.* iii. 400. — Dietrich, *Syn.* i. 504. — Torrey & Gray, *Fl. N. Am.* i. 652. — Torrey, *Fl. N. Y.* i. 290. — Darlington, *Fl. Cestr.* ed. 3, 111. — Chapman, *Fl.* 168. — Curtis, *Rep. Geolog. Surv. N. Car.* 1860, iii. 60. — Koch, *Dendr.* i. 694. — Emerson, *Trees Mass.* ed. 2, ii. 467, t. — Baillon, *Hist. Pl.* vii. 68, f. 46. — Ridgway, *Proc. U. S. Nat. Mus.* 1882, 67. — Lauche, *Deutsche Dendr.* ed. 2, 516. — Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix. 90. — Coulter & Evans, *Bot. Gazette*, xv. 32. — Watson & Coulter, *Gray's Man.* ed. 6, 214.

Benthamidia florida, Spach, *Hist. Vég.* viii. 107 (1839).

A low bushy tree, rarely forty feet in height, with a short trunk twelve to eighteen inches in diameter, slender spreading or upright branches and diverging branchlets turned upwards near the ends; or frequently toward the northern limits of its range a many-stemmed shrub. The bark of the trunk, which varies from an eighth to a quarter of an inch in thickness, has a dark red-brown surface divided into quadrangular or many-sided plate-like scales. The branchlets, when they first appear, are pale green or green tinged with red, and are glabrous or slightly puberulous; in their first winter they are bright red or yellow-green and are nearly surrounded by the narrow ring-like leaf-scars, while later they become light brown or gray tinged with red. The buds are formed in midsummer, and are covered by two opposite acute pointed scales rounded on the back and connate below for half their length; the terminal bud is accompanied by two pairs of lateral buds, each covered by a single scale; the scales of the outer pair of these lateral buds usually fall in autumn, and the inclosed shoots then often remain undeveloped; on fertile shoots the terminal bud is replaced by the head of flower-buds which, by midsummer, protrudes from between the two upper lateral buds. The leaves are involute in vernation, ovate to elliptical or rarely slightly obovate, acute and often contracted into slender points at the apex, gradually narrowed at the base, remotely and obscurely crenulate-toothed on the somewhat thickened margins and mostly clustered toward the ends of the branches; when they unfold they are pale, pubescent below, and faintly puberulous above, and at maturity are thick and firm, bright green, and covered with minute appressed hairs on the upper surface, and pale or sometimes almost white and more or less pubescent on the lower, from three to six inches long and an inch and a half to two inches broad; they have prominent light-colored midribs deeply impressed above, five or six pairs of primary veins parallel with their sides and connected by obscure reticulated veinlets, and grooved petioles from one half to three quarters of an inch in length. In the autumn they turn bright scarlet. The head of flower-buds is inclosed by four involucral scales which remain light brown and more or less covered with pale hairs through the winter, and is borne on a stout club-shaped puberulous reddish peduncle which during the

winter is a quarter of an inch or less in length, but, by the time the flowers have expanded, is an inch or an inch and a half long. The involucral scales begin to unfold, enlarge, and grow white with the first warm days of spring, and when the flowers open, which in Texas takes place in March and in Massachusetts in May, when the leaves are half grown, these scales form a flat corolla-like cup three or four inches in diameter; at maturity they are obcordate, an inch or an inch and a half wide, gradually narrowed below the middle, the rounded apex notched by its growing round the discolored and thickened remnants of the portion formed during the previous summer,[1] reticulate-veined, and pure white, pink, or rarely bright red; they fall after the fading of the flowers. The flower-buds, which are collected in close many-flowered cymes, are oblong, obtuse, puberulous with pale hairs, and sessile in the axils of broadly ovate nearly triangular minutely apiculate glabrous light green deciduous bractlets. The flowers are an eighth of an inch across when expanded; the calyx is terete, slightly urceolate, puberulous, obtusely four-lobed, and light green; the corolla-lobes are strap-shaped, rounded or acute at the apex, slightly thickened on the margins, puberulous on the outer surface, glabrous on the inner, reflexed after anthesis, and green tipped with yellow; the disk is large and orange-colored, and the style is columnar and crowned with a truncate stigma. The fruit ripens in October, usually only three or four drupes being developed from a head of flowers; they are surrounded by the remnants of abortive flowers and are ovoid, crowned with the remnants of the narrow persistent calyx and with the style, bright scarlet, half an inch long and a quarter to half an inch broad, with thin mealy flesh and a smooth ovate thick-walled slightly grooved stone, acute at the two ends and containing two oblong seeds, or often only one, covered with a thin pale coat.

Cornus florida is distributed from eastern Massachusetts to southern Ontario[2] and southwestern Missouri,[3] and southward to central Florida and the valley of the Brazos River in Texas, and reappears on the Sierra Madre and several of the other mountain ranges of eastern and southern Mexico.[4] Comparatively rare at the north, the Flowering Dogwood is one of the commonest and most generally distributed inhabitants of the deciduous forests of the middle and southern states, growing under the shade of taller trees in rich well-drained soil, and from the coast nearly to the summits of the high Alleghany Mountains.

The wood of *Cornus florida* is heavy, hard, and strong, tough and close-grained, with a satiny surface susceptible of receiving a beautiful polish; it contains numerous conspicuous medullary rays, and is brown, sometimes changing to shades of green and red, with lighter colored sapwood composed of thirty to forty layers of annual growth. The specific gravity of the absolutely dry wood is 0.8153, a cubic foot weighing 50.81 pounds. It is largely used in turnery, for the bearings of machinery, the hubs of small wheels, barrel-hoops, the handles of tools, and occasionally for engravers' blocks.

The bark, especially that of the roots, which contains a bitter principle, cornin or cornic acid,[5] is astringent and slightly aromatic, and is occasionally used in the form of powder, decoctions, or fluid extracts, in the treatment of intermittent and malarial fevers,[6] and in homœopathic practice.[7]

The Flowering Dogwood is one of the most beautiful of the small trees of the American forests, which it enlivens in early spring with the whiteness of its floral leaves and in autumn with the splendor

[1] Meehan, *Proc. Phil. Acad.* 1892, 377.

[2] Bell, *Geolog. Rep. Can.* 1879–80, 55°. — Macoun, *Cat. Can. Pl.* i. 190.

[3] Broadhead, *Bot. Gazette*, iii. 53.

[4] Hemsley, *Bot. Biol. Am. Cent.* i. 575.

Specimens gathered by Mr. C. G. Pringle on the Sierra Madre are peculiar in the snowy whiteness of the under surface of the leaves, which is clothed with thick pubescence.

[5] Geiger, *Ann. Chem. und Pharm.* xiv. 206. — A. J. Frey, *Am. Jour. Pharm.* 1878, 390.

[6] Schoepf, *Mat. Med. Amer.* 14. — J. M. Walker, *An Experimental Inquiry into the similarity in virtue between the Cornus florida and sericea, and the Cinchona officinalis of Linnæus.* — Barton, *Coll.* ed. 3, i. 12, 47; ii. 17. — W. P. C. Barton, *Med. Bot.* i. 43, t. 3. — Bigelow, *Med. Bot.* ii. 73, t. 28. — Rafinesque, *Med. Fl.* i. 131, t. 28. — Lindley, *Fl. Med.* 81. — A. Richard, *Hist. Mat. Méd.* iii. 554. — Griffith, *Med. Bot.* 347, f. 164. — Carson, *Med. Bot.* i. 50, t. 42. — Porcher, *Resources of Southern Fields and Forests*, 59. — Bentley & Trimen, *Med. Pl.* ii. 136, t. 136. — Johnson, *Man. Med. Bot. N. Am.* 158, t. 5. — *U. S. Dispens.* ed. 16, 508.

[7] Millspaugh, *Am. Med. Pl. in Homœopathic Remedies*, i. 71, t. 71.

of its foliage and the brilliancy of its fruit.[1] No tree is more desirable in the garden or park[2] in regions where the summer's sun is sufficiently hot to insure the production of its flowers through the perfect development of the branchlets.[3] A variety with pendulous branches, discovered a few years ago in the forests of Maryland, and one with bright red involucral scales are now often cultivated.

The first published account of *Cornus florida* appeared in the *Phytographia* of Plukenet in 1691;[4] his information was probably derived from John Banister, the English missionary in Virginia, although there is no mention of the Flowering Dogwood in Banister's printed catalogue of Virginia plants. According to Loudon,[5] it was cultivated in England in 1730 by Thomas Fairchild,[6] and a few years later by Philip Miller in the Physic Garden at Chelsea.[7]

Cornus florida is easily raised from seeds,[8] which germinate in the second year; it requires moderately rich well-drained soil, and under favorable conditions begins to flower when ten or twelve years old.

[1] Kalm, *Travels*, English ed. i. 160; ii. 163. — W. Bartram, *Travels*, 401.

[2] *Garden and Forest*, iii. 431, f. 54.

[3] In Great Britain and other countries of northern and central Europe *Cornus florida* rarely produces flowers (Loudon, *Arb. Brit.* ii. 1017. — *The Garden*, xxxiii. 441; xliii. 150).

[4] *Cornus Virginiana, flosculis plurimis albidis ex involucro tetrapetalo rubro erumpentibus*, t. 26, f. 3; *Alm. Bot.* 120. — Catesby, *Nat. Hist. Car.* i. 27, t. 27.

Cornus involucro maximo, foliolis obverse cordatis, Linnæus, *Hort. Cliff.* 38; *Hort. Ups.* 29. — Royen, *Fl. Leyd. Prodr.* 249. — Clayton, *Fl. Virgin.* 17. — Colden, *Act. Hort. Ups.* 1743, 89 (*Pl. Novebor.*). — Miller, *Dict.* ed. 7, No. 3. — Duhamel, *Traité des Arbres*, i. 182.

[5] Loudon, *l. c.*

[6] Thomas Fairchild (1667?–1729), a nurseryman and florist at Hoxton near London, who united a love of science with the successful practice of his art. In 1722 he published *The City Gardener, containing the most experienced method of cultivating and ordering such evergreens, fruit-trees, flowering shrubs, flowers, exotick plants, etc., as will be ornamental, and thrive best in the London Gardens*, and in 1724, in the *Philosophical Transactions* (xxxiii. 127–132), *An Account of some new Experiments relating to the different and sometimes contrary Motion of the Sap of Plants and Trees.* He was a correspondent of Linnæus, and by his will left to the Trustees of the Charity School of Shoreditch, where he died, £25, the income of which was to be used for an annual sermon to be preached on Whitsun Tuesday (Felton, *Portraits of English Authors on Gardening*, ed. 2, 60. — *The Cottage Gardener*, vi. 143).

[7] Aiton, *Hort. Kew.* i. 157.

[8] The great abundance of this tree in those parts of the country where the climate is not too severe for it may be explained by the fact that the fruit is a favorite food of many birds, who scatter the seeds without injuring their vitality.

EXPLANATION OF THE PLATES.

Plate CCXII. Cornus florida.

1. A flowering branch, natural size.
2. A flower, enlarged.
3. Vertical section of a flower, enlarged.
4. An ovary cut crosswise, enlarged.

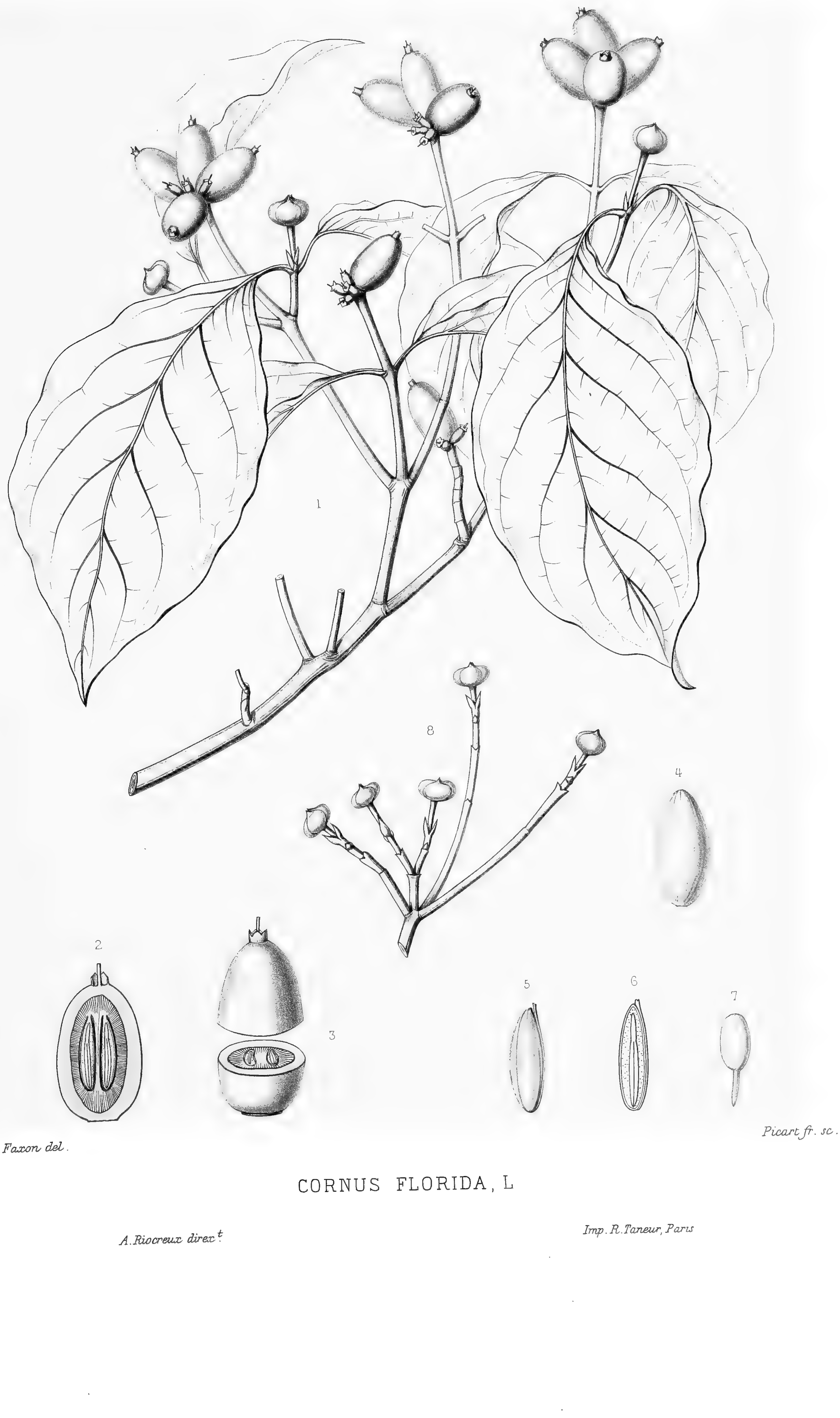
Plate CCXIII. Cornus florida.

1. A fruiting branch, natural size.
2. Vertical section of a fruit, enlarged.
3. A fruit cut crosswise, enlarged.
4. A nutlet, enlarged.
5. A seed, enlarged.
6. Vertical section of a seed, enlarged.
7. An embryo, much magnified.
8. A winter branchlet with flower-buds, natural size.

C.E Faxon del. Picart fr. sc.

CORNUS FLORIDA, L.

A. Riocreux direx.t Imp R. Taneur, Paris.



C.E. Faxon del.

Picart fr. sc.

CORNUS FLORIDA, L

A. Riocreux direx.t

Imp. R. Taneur, Paris

CORNUS NUTTALLII.

Dogwood.

HEADS of flower-buds not inclosed; involucral scales 4 to 6, oblong to obovate, usually acute at the apex. Leaves ovate or rarely obovate.

Cornus Nuttallii, Audubon, *Birds*, t. 467 (1837); *Orn. Biogr.* iv. 482. — Torrey & Gray, *Fl. N. Am.* i. 652. — Walpers, *Rep.* ii. 435. — Bentham, *Pl. Hartweg.* 314. — Nuttall, *Sylva*, iii. 51, t. 97. — Torrey, *Pacific R. R. Rep.* iv. 94; *Bot. Mex. Bound. Surv.* 71; *Bot. Wilkes Explor. Exped.* 326. — Newberry, *Pacific R. R. Rep.* vi. 24, 75. — Cooper, *Pacific R. R. Rep.* xii. pt. ii. 29, 63. — Lyall, *Jour. Linn. Soc.* vii. 134. — Gray, *Proc. Am. Acad.* viii. 387. — Brewer & Watson, *Bot. Cal.* i. 274; ii. 452. — Hall, *Bot. Gazette*, ii. 88. — Sargent, *Forest Trees N. Am. 10th Census U. S.* ix. 91. — Coulter & Evans, *Bot. Gazette*, xv. 33.

Cornus florida, Hooker, *Fl. Bor.-Am.* i. 277 (in part) (1833).

A tree, forty to sixty feet or exceptionally one hundred feet[1] in height, with a trunk one or two feet in diameter, and slender spreading branches which form an oblong-conical or ultimately a round-topped head. The bark of the trunk is a quarter of an inch thick, brown tinged with red, and divided on the surface into small thin appressed scales. The branchlets are slender, light green, and coated when young with pale hairs; in their first winter they are glabrous or puberulous, dark reddish purple or sometimes green, conspicuously marked by the elevated lunate leaf-scars, and later become light brown or brown tinged with red. The buds, which are formed in July, are acute, a third of an inch in length, and covered with two narrowly ovate acute long-pointed puberulous light green opposite scales; the terminal bud is accompanied by two pairs of lateral buds, each covered by a single scale; the scales of the lower pair usually fall in the autumn and the buds remain undeveloped, and those of the upper pair, which are now coated with pale hairs, especially toward the apex, thicken and turn dark purple, and, lengthening in the spring with the shoots which they inclose, finally become scarious or often develop into small leaves, and in falling mark the base of the branchlets with ring-like scars. The leaves are involute in vernation, ovate or slightly obovate, acute and often contracted into short points at the apex, wedge-shaped at the base and faintly crenulate-serrate, and are generally clustered toward the ends of the branches; when they unfold they are coated below with pale tomentum and are puberulous above, while at maturity they are membranaceous, bright green, and slightly puberulous, with short appressed hairs on the upper surface and woolly pubescent on the lower, and are four or five inches in length and an inch and a half to three inches in breadth, with prominent pale midribs impressed above, about five pairs of slender primary veins nearly parallel with their margins and connected by remote reticulated veinlets, and stout grooved hairy petioles from one half to two thirds of an inch long, with large clasping bases. In the autumn the leaves become brilliant orange and scarlet before falling. The head of flower-buds appears during the summer from between the upper pair of lateral leaf-buds, and is surrounded at the base but not inclosed by the involucral scales; during the winter it is hemispherical, covered only at the base by the involucre, half an inch in diameter, and is usually nodding by the reflexion above the middle of the stout hairy peduncle, which is enlarged at the apex and three quarters of an inch to an inch in length. In early spring, when the flowers open, the involucral scales have become an inch and a half to three inches long and an inch and a half to two inches wide; they are now white or white tinged with pink, narrowly oblong to obovate or sometimes nearly orbicular, abruptly acute, acuminate or obtuse, entire and thickened at the apex with the remnants of the portions of the scales formed during the previous summer, puberulous on the outer surface, gradually narrowed

[1] Kellogg, *Forest Trees of California*, 112.

below the middle and conspicuously eight-ribbed, the spreading ribs being united by reticulated veinlets. The flowers, which are crowded in dense cymose heads, are produced in the axils of minute acuminate scarious deciduous bracts. The calyx is terete, slightly urceolate, puberulous on the outer surface and yellow-green, or in one form light purple, with dark red-purple lobes; the petals are strap-shaped, rounded at the apex, spreading, somewhat puberulous on the outer surface, with thickened slightly inflexed margins; they are yellow-green, or in the purple-flowered form yellow below the middle on the inner surface and of a dark plum-color above it; the style is columnar and crowned with a truncate stigma. The fruit ripens in October, thirty or forty drupes being crowded into a dense spherical head, which is surrounded at the base by a ring of abortive pendulous ovaries; the drupes are half an inch long, ovoid, much flattened by mutual pressure, crowned with the broad persistent calyx, and bright red or orange-color, with thin mealy flesh and thick-walled one or two-seeded stones which are obtuse at both ends and scarcely grooved. The seeds are oblong, compressed, and covered with a very thin pale papery coat.

Cornus Nuttallii is distributed from the valley of the lower Fraser River[1] and Vancouver's Island,[2] southward along the coast of British Columbia, through western Washington and Oregon, and southward on the coast ranges of California to the San Bernardino Mountains and on the western slopes of the Sierra Nevada. It grows usually in moist well-drained soil under the shade of coniferous forests, ascending on the Cascade Mountains to an elevation of three thousand feet above the sea-level and of four or five thousand at the southern limits of its range, and attaining its greatest size near the shores of Puget Sound and in the Redwood forests of northern California.

The wood of *Cornus Nuttallii* is heavy, exceedingly hard, strong, and close-grained, with a satiny surface susceptible of receiving a good polish; it contains numerous obscure medullary rays, and is light brown tinged with red, with lighter colored sapwood composed of thirty to forty layers of annual growth. The specific gravity of the absolutely dry wood is 0.7481, a cubic foot weighing 46.42 pounds. It is used in cabinet-making, for malls, the handles of tools, etc.

The flower-clusters of *Cornus Nuttallii* are more beautiful and conspicuous than the flowers of any other tree of the Pacific states; and in early spring, when the great flower-scales have grown to their full size, it lights up the dark and sombre forests which are the home of the Dogwood as with a bridal wreath, and as with tongues of flame late in the year, when the beauty of the brilliantly colored leaves and large heads of bright fruit is often heightened by the appearance of autumnal flowers.

Cornus Nuttallii was discovered on the banks of the lower Columbia River by David Douglas[3] in 1825 or 1826; it was first mistaken for the Flowering Dogwood of the east, and was not distinguished from that species until several years later by Thomas Nuttall[4] in his transcontinental journey.[5]

[1] Macoun, *Cat. Can. Pl.* i. 190.

[2] G. M. Dawson, *Canadian Nat.* n. ser. ix. 331.

[3] See ii. 94.

[4] See ii. 34.

[5] Various attempts have been made in the eastern states and in Europe to cultivate this magnificent tree, but although the seeds germinate readily the young plants soon perish, and the right method of managing them, so far as I have heard, has not yet been discovered.

EXPLANATION OF THE PLATES.

PLATE CCXIV. CORNUS NUTTALLII.

1. A flowering branch, natural size.
2. A flower, enlarged.
3. Vertical section of a flower, enlarged.
4. A fruiting branchlet, natural size.
5. Vertical section of a fruit, enlarged.
6. A fruit cut crosswise, enlarged.
7. An embryo, much magnified.

PLATE CCXV. CORNUS NUTTALLII.

1. A flowering branch, with an involucre of six scales, natural size.
2. A winter branchlet with head of flower-buds, natural size.

C.E. Faxon del. *Picart fr sc.*

CORNUS NUTTALLII, Aud.

A. Riocreux direx.t *Imp. R. Taneur, Paris.*

C.E. Faxon del.

Picart fr. sc.

CORNUS NUTTALLII, Aud.

A. Riocreux direx.t

Imp. R. Taneur, Paris.

CORNUS ALTERNIFOLIA.

Dogwood.

LEAVES mostly alternate, clustered at the ends of the branches.

Cornus alternifolia, Linnæus f. *Syst.* ed. 13, Suppl. 125 (1781). — Lamarck, *Dict.* ii. 116; *Ill.* i. 303. — L'Héritier, *Cornus*, 10, t. 6. — Ehrhart, *Beitr.* iii. 19. — Du Roi, *Harbk. Baumz.* ed. 2, i. 253. — Schmidt, *Oestr. Baumz.* ii. 15, t. 70. — Willdenow, *Berl. Baumz.* 77; *Spec.* i. 664; *Enum.* 165. — Michaux, *Fl. Bor.-Am.* i. 93. — Persoon, *Syn.* i. 144. — Desfontaines, *Hist. Arb.* i. 351. — *Nouveau Duhamel*, ii. 157, t. 45. — Pursh, *Fl. Am. Sept.* i. 109. — Nuttall, *Gen.* i. 99. — Roemer & Schultes, *Syst.* iii. 323; *Mant.* 251. — Elliott, *Sk.* i. 210. — Bigelow, *Fl. Boston.* ed. 2, 58. — Guimpel, Otto & Hayne, *Abbild. Holz.* 53, t. 43. — Hayne, *Dendr. Fl.* 8. — Sprengel, *Syst.* i. 451. — De Candolle, *Prodr.* iv. 271. — Hooker, *Fl. Bor.-Am.* i. 275. — Don, *Gen. Syst.* iii. 398. — Tausch, *Regensb. Flora*, 1838, 732. — Spach, *Hist. Vég.* viii. 92. — Dietrich, *Syn.* i. 503. — Torrey & Gray, *Fl. N. Am.* i. 649. — Torrey, *Fl. N. Y.* i. 288. — C. A. Meyer, *Mém. Acad. Sci. St. Pétersbourg*, sér. 6, 203. — Walpers, *Rep.* v. 932. — Chapman, *Fl.* 167. — Curtis, *Rep. Geolog. Surv. N. Car.* 1860, iii. 61. — Koch, *Dendr.* i. 690. — Emerson, *Trees Mass.* ed. 2, ii. 463, t. — Lauche, *Deutsche Dendr.* ed. 2, 514. — Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix. 90. — Coulter & Evans, *Bot. Gazette*, xv. 90. — Watson & Coulter, *Gray's Man.* ed. 6, 215. — MacMillan, *Bot. Rep. Geolog. Surv. Minn.* 400 (*Metasperm. Minn. Vall.*).

Cornus alterna, Marshall, *Arbust. Am.* 35 (1785).

Cornus undulata, Rafinesque, *Alsograph. Am.* 61 (1838).

Cornus rotundifolia, Rafinesque, *Alsograph. Am.* 62 (1838).

Cornus riparia, Rafinesque, *Alsograph. Am.* 62 (1838).

Cornus riparia, var. **rugosa**, Rafinesque, *Alsograph. Am.* 62 (1838).

Cornus punctata, Rafinesque, *Alsograph. Am.* 62 (1838).

A flat-topped bushy tree, rarely twenty-five to thirty feet in height, with a short trunk six or eight inches in diameter, and long slender alternate divergent horizontal branches from which rise numerous short upright flower-bearing branchlets; or often a shrub sending up several stems from the ground. The bark of the trunk is an eighth of an inch thick, dark reddish brown and smooth, or divided by shallow longitudinal fissures into narrow ridges irregularly broken transversely. The winter-buds are acute, light chestnut-brown, and covered with four or five imbricated ovate acute lustrous scales which are rounded on the back and thickened and short-pointed at the apex; those of the inner ranks are accrescent, half an inch long at maturity, scarious, and more or less persistent on the growing shoots, which, in falling, they mark with ring-like scars. The branchlets are slender, pale orange-green to reddish brown when they first appear, mostly light green or sometimes brown tinged with green during their first winter, later turning darker green, and are marked with pale lunate leaf-scars and small scattered pale dots. The leaves are alternate or rarely opposite, involute in vernation, oval or ovate, gradually contracted at the apex into long slender points, wedge-shaped or occasionally somewhat rounded at the base, and obscurely crenulate-toothed on the slightly thickened and reflexed margins; when they unfold they are coated on the lower surface with dense silvery white tomentum, and are faintly tinged with red and pilose above; at maturity they are membranaceous, bright yellow-green, and glabrous or sparsely pubescent on the upper, and pale or sometimes nearly white and covered with appressed hairs on the lower surface, three to five inches long and two and a half to three and a half inches wide, with broad orange-colored midribs slightly impressed above, about six pairs of primary veins parallel with their sides, and slender pubescent grooved petioles which have enlarged clasping bases and are an inch and a half to two inches long. In the autumn the leaves turn yellow or yellow and scarlet. The flowers, which are produced mostly on lateral branchlets, in terminal flat puberulous many-flowered cymes an inch and a half to two inches and a half wide, are borne on slender jointed pedicels from an eighth of an inch to a quarter of an inch long, and appear from the beginning of May in the middle states to the end of June at the extreme north and on the high Alleghany

Mountains; they are cream-color, with an oblong cup-shaped obscurely toothed calyx coated with hoary tomentum, narrow oblong corolla-lobes which are rounded at the apex, an eighth of an inch long and reflexed after anthesis, long slender filaments with nodding anthers, and a columnar style with a prominent stigma. The fruit is borne in loose spreading red-stemmed clusters and ripens in October; it is subglobose, dark blue-black, a third of an inch across, and tipped with the remnant of the style, which rises from the bottom of a small depression; the nutlet, which is covered with a thin coat of dry bitter flesh, is obovoid, pointed at the base, longitudinally many-grooved, thick-walled, and one or two-seeded. The seed is lunate, compressed, and a quarter of an inch long, with a thin membranaceous pale coat and copious albumen.

Cornus alternifolia is distributed from New Brunswick and Nova Scotia westward along the valley of the St. Lawrence River to the northern shores of Lake Superior[1] and Minnesota, and southward through the northern states, and along the Alleghany Mountains to northern Georgia and Alabama. It is a common inhabitant of rich woodlands, growing usually along the margins of the forest and by the borders of streams and swamps in moist well-drained soil.

The wood of *Cornus alternifolia* is heavy, hard, and close-grained, with numerous thin medullary rays, and is brown tinged with red, with thick light-colored sapwood composed of twenty to thirty layers of annual growth. The specific gravity of the absolutely dry wood is 0.6696, a cubic foot weighing 41.73 pounds.

Cornus alternifolia, which was overlooked by the early botanists in North America, was cultivated in England by James Gordon[2] in 1760.[3] The peculiar habit of this species with its wide-spreading branches and flat-topped head, its handsome foliage, and abundant flowers and fruit make it a desirable ornament for parks and gardens, although in cultivation it is often injured by fungal diseases.

[1] Macoun, *Cat. Can. Pl.* i. 192, 538.

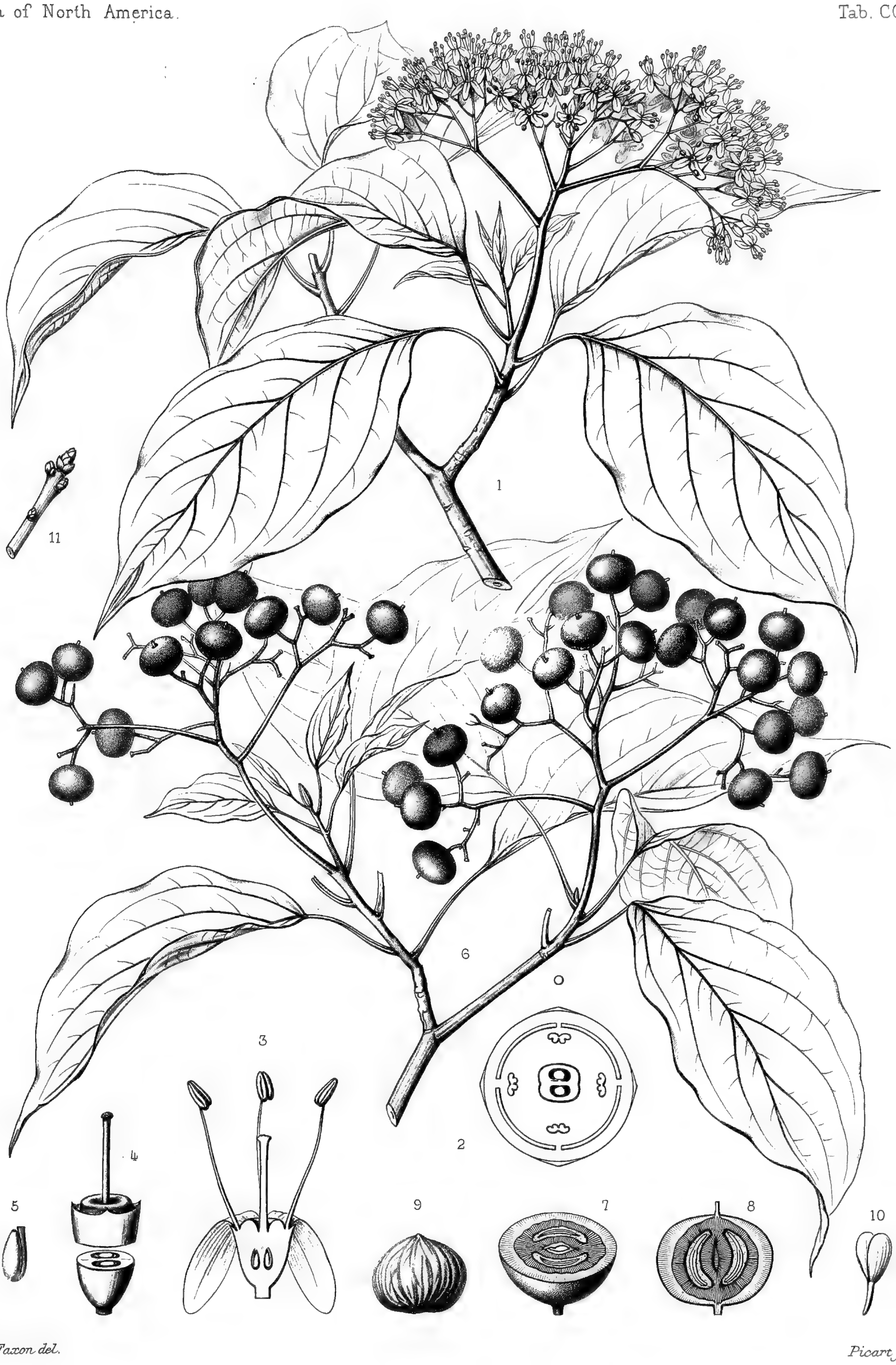
[2] See i. 30.

[3] Aiton, *Hort. Kew.* i. 159. — Loudon, *Arb. Brit.* ii. 1010, f. 760.

EXPLANATION OF THE PLATE.

PLATE CCXVI. CORNUS ALTERNIFOLIA.

1. A flowering branch, natural size.
2. Diagram of a flower.
3. Vertical section of a flower, enlarged.
4. A flower with the petals and stamens removed, cut crosswise, enlarged.
5. An ovule, much magnified.
6. A fruiting branch, natural size.
7. Cross section of a fruit, enlarged.
8. Vertical section of a fruit, enlarged.
9. A nutlet, enlarged.
10. An embryo, much magnified.
11. End of a winter branchlet, natural size.



C.E. Faxon del. Picart fr. sc.

CORNUS ALTERNIFOLIA, L. f.

A. Riocreux direx.t Imp. R. Taneur, Paris.

NYSSA.

FLOWERS polygamo-diœcious; calyx 5-toothed; petals 5, imbricated in æstivation; stamens 5 to 12; ovary 1 or rarely 2-celled; ovules solitary, suspended. Fruit a fleshy drupe. Leaves alternate, petiolate, destitute of stipules, deciduous.

Nyssa, Linnæus, *Gen.* 308 (1737). — A. L. de Jussieu, *Gen.* 75. — Endlicher, *Gen.* 328. — Meisner, *Gen.* 328. — Bentham & Hooker, *Gen.* i. 952. — Baillon, *Hist. Pl.* vi. 281.
Tupelo, Adanson, *Fam. Pl.* ii. 80 (1763).
Ceratostachys, Blume, *Bijdr. Fl. Ned. Ind.* 644 (1825). — Meisner, *Gen.* 110. — Endlicher, *Gen.* 1183.
Agathisanthes, Blume, *Bijdr. Fl. Ned. Ind.* 645 (1825). — Meisner, *Gen.* 110. — Endlicher, *Gen.* 1183.

Trees, with terete branchlets and scaly buds, the scales of the inner ranks accrescent. Leaves alternate, conduplicate in vernation, petiolate, entire or sometimes remotely angulate or toothed, mostly crowded at the ends of the branches, deciduous or persistent. Flowers minute, greenish white. The staminate on slender pedicels from the axils of minute caducous bracts in simple or compound clusters on long axillary peduncles bibracteolate near the middle or at the apex or sometimes ebracteolate. Calyx disciform or cup-shaped, the limb five or many-toothed. Petals five or indefinite, equal or unequal, ovate or linear-oblong, thick, inserted on the margin of the conspicuous pulvinate entire or lobed disk, erect. Stamens five or indefinite, exserted; filaments filiform, inserted on the margin of the disk; anthers oblong, introrse, attached at the base, two-celled, the cells opening longitudinally. Ovary rudimentary or wanting. Pistillate flowers on axillary peduncles, in two or few-flowered clusters, sessile or nearly so in the axil of a conspicuous bract and furnished with one or two smaller lateral bractlets, or solitary and surrounded by two to four bractlets. Calyx-tube urceolate or campanulate, the limb five-toothed. Petals small, thick, and spreading. Stamens five to ten or wanting; filaments short; anthers fertile or sterile. Disk less developed than in the sterile flower, depressed in the centre. Ovary inferior, one or two-celled; style terete, elongated, simple or rarely forked, recurved, sulcate on the inner face, stigmatic toward the apex; ovules solitary, suspended from the interior angle of the apex of the cell, anatropous; raphe ventral; micropyle superior. Fruit drupaceous, oblong, areolate at the apex; sarcocarp thin, oily, acidulous; putamen thick-walled, bony, terete or compressed, slightly or conspicuously longitudinally ridged or winged, one or rarely two-celled, usually one-seeded. Seed filling the cavity of the stone; testa membranaceous. Embryo straight, in the centre of the copious fleshy albumen and nearly as long; cotyledons foliaceous, much longer than the terete radicle turned toward the hilum.

Nyssa is now confined to the eastern United States, where three species are distinguished, and to southern Asia, where the genus is represented by a single species[1] distributed from the eastern Himalayas to the island of Java. In the tertiary epoch Nyssa perhaps inhabited the Arctic Circle and then spread over Europe[2] and Alaska,[3] and traces of it occur in the Laramie group of western America.[4]

The American species produce tough wood with intricately contorted and twisted grain, and the

[1] *Nyssa arborea.*

Ceratostachys arborea, Blume, *Bijdr. Fl. Ned. Ind.* 644 (1825). — Miquel, *Fl. Ned. Ind.* i. 839.

Agathisanthes Javanica, Blume, *l. c.* 645 (1825). — Miquel, *l. c.*

Nyssa sessiliflora, Bentham & Hooker, *Gen.* i. 952 (1867). — Hooker f. *Fl. Brit. Ind.* ii. 747. — Gamble, *Man. Indian Timbers*, 211.

Ilex daphnephylloides, Kurz, *Jour. Asiatic Soc.* 1870, pt. ii. 72.

Daphniphyllopsis capitata, Kurz, *l. c.* 1875, pt. ii. 201; *Forest Fl. Brit. Burm.* i. 240.

[2] Heer, *Fl. Foss. Arct.* ii. 477, t. 43, f. 12c; t. 50, f. 5–7. — Zittel, *Handb. Palæontolog.* ii. 611.

[3] Lesquereux, *Rep. U. S. Geolog. Surv.* viii. 261 (*Contrib. Foss. Fl. Western Territories*).

[4] L. F. Ward, 6*th Ann. Rep. U. S. Geolog. Surv.* 1884–85, 553, t. 47, f. 7 (*Syn. Fl. Laramie Group*).

fruit of one of them is sometimes used as a conserve. The genus is not known to possess other useful properties.

In America Nyssa is little injured or disfigured by insects,[1] and is not seriously affected by fungal diseases.[2]

Nyssa, the name of a nymph, was bestowed by Linnæus upon the species of the genus which grow in water.

[1] Web-worms occasionally disfigure the different species, and the caterpillars of *Everyx chœrilus*, Cramer, also feed among the leaves. The larvæ of *Antispila nyssæfoliella*, Clemens (*Proc. Phil. Acad.* 1860, 11), and of *Nepticula nyssæella*, Clemens, have been observed to mine within the parenchyma of the leaves. In North Carolina a Scale-insect, *Chionaspis Nyssæ*, Comstock (*Rep. U. S. Dept. Agric.* 1880, 316), has been found on Nyssa.

[2] More than fifty species of fungi have been recorded as living upon the species of this genus in the United States, principally on *Nyssa sylvatica*. Most of them are small black species sometimes found also on other plants, and none produce marked disease, although the leaves of young shoots are sometimes somewhat disfigured by *Glenospora Curtisii*, Berkeley and Desmazière.

SYNOPSIS OF THE NORTH AMERICAN SPECIES.

Stones of the fruit with more or less distinct low broad rounded ridges.
- Leaves linear-oblong to oval or obovate . . . . . 1. N. SYLVATICA.

Stones of the fruit with prominent, winged, or acute ridges.
- Leaves oblong-oval or obovate, usually obtuse at the apex . . . . . 2. N. OGECHE.
- Leaves oval or oblong, acute or acuminate . . . . . 3. N. AQUATICA.

NYSSA SYLVATICA.

Tupelo. Pepperidge.

FRUIT small, the stone more or less distinctly ridged. Leaves linear-oblong to oval or obovate.

Nyssa sylvatica, Marshall, *Arbust. Am.* 97 (1785). — Castiglioni, *Viag. negli Stati Uniti*, ii. 304. — Michaux f. *Hist. Arb. Am.* ii. 260, t. 21. — Poiret, *Lam. Dict.* Suppl. iv. 116. — W. P. C. Barton, *Compend. Fl. Phil.* ii. 193. — Sargent, *Forest Trees N. Am. 10th Census U. S.* ix. 92. — Watson & Coulter, *Gray's Man.* ed. 6, 215.

Nyssa multiflora, Wangenheim, *Nordam. Holz.* 46, t. 16, f. 39 (1787). — Walter, *Fl. Car.* 253. — Elliott, *Sk.* ii. 684. — Spach, *Hist. Vég.* x. 463. — Torrey, *Fl. N. Y.* ii. 161, t. 95. — Schnizlein, *Icon.* t. 108**, f. 1, 2. — Darlington, *Fl. Cestr.* ed. 3, 254. — Chapman, *Fl.* 168. — Curtis, *Rep. Geolog. Surv. N. Car.* 1860, iii. 62. — Koch, *Dendr.* ii. 454. — Emerson, *Trees Mass.* ed. 2, ii. 353, t. — Ridgway, *Proc. U. S. Nat. Mus.* 1882, 68. — Lauche, *Deutsche Dendr.* ed. 2, 543.

Nyssa Caroliniana, Poiret, *Lam. Dict.* iv. 507 (1797); *Ill.* iii. 442, t. 851, f. 1.

Nyssa Canadensis, Poiret, *Lam. Dict.* iv. 507 (1797).

Nyssa integrifolia, Aiton, *Hort. Kew.* iii. 446 (1789). — Persoon, *Syn.* ii. 614.

Nyssa villosa, Michaux, *Fl. Bor.-Am.* ii. 258 (1803). — Willdenow, *Spec.* iv. 1112. — Desfontaines, *Hist. Arb.* i. 37. — Aiton, *Hort. Kew.* ed. 2, v. 479. — Bigelow, *Fl. Boston.* 248. — Pursh, *Fl. Am. Sept.* i. 177. — Nuttall, *Gen.* ii. 236. — Roemer & Schultes, *Syst.* v. 575. — Sprengel, *Syst.* i. 832. — Dietrich, *Syn.* i. 878. — Loudon, *Arb. Brit.* iii. 1317, f. 1197, 1198.

Nyssa multiflora, var. **sylvatica**, Watson, *Index*, 442 (1878).

Nyssa aquatica, Coulter & Evans, *Bot. Gazette*, xv. 91 (not Linnæus nor Marshall) (1890). — Coulter, *Contrib. U. S. Nat. Herb.* ii. 151 (*Man. Pl. W. Texas*).

A tree, with crowded slender spreading and pendulous tough flexible branches, short stout spur-like lateral branchlets, and long thick hard roots, occasionally one hundred feet in height, with a trunk which is usually short, often enlarged and swollen at the base, and occasionally five feet in diameter; generally in the northern and extreme southern states much smaller and rarely more than fifty or sixty feet in height. The head is sometimes short and cylindrical, with a flat top; sometimes it is low and broad, or, when the individual has been crowded by other trees in the forest, it is narrow, pyramidal, or conical, and sometimes it is inversely conical and broad and flat at the top. The bark of the trunk varies from three quarters of an inch to an inch and a half in thickness, and is light brown, often tinged with red, and deeply fissured, the surface of the ridges being covered with small irregularly shaped scales. The branchlets are at first light green to orange-color, nearly glabrous, or often covered with dense pale or rufous pubescence; during their first winter they are light red-brown marked with minute scattered pale lenticular dots and with the small lunate leaf-scars which display the ends of three conspicuous groups of fibro-vascular bundles, and later become darker. The winter-buds are obtuse and a quarter of an inch long, and are covered with ovate acute apiculate dark red puberulous imbricated scales; those of the inner ranks are accrescent, bright-colored at maturity, and mark the base of the branchlets with obscure ring-like scars. The leaves, which are crowded on the ends of the lateral branchlets, or are remote on vigorous shoots, are deciduous, linear-oblong, lanceolate, oval or obovate, acute or acuminate, sometimes contracted into short broad points at the apex, wedge-shaped or occasionally rounded at the base, entire, with slightly thickened margins, or are rarely coarsely dentate; when they unfold they are coated with rufous tomentum, especially on the lower surface, or are pubescent or sometimes nearly glabrous; at maturity they are thick and firm, dark green and very lustrous above, pale and often hairy below, principally along the broad midribs, which are impressed above, and on the primary veins; they are two to five inches long, half an inch to three inches broad, with slender or stout

terete or wing-margined ciliate petioles which vary from a quarter of an inch to an inch and a half in length, and are often bright red. In the autumn they turn bright scarlet on the upper surface only. The flowers, which are yellowish green, appear when the leaves are about one third grown, from April in Florida to the middle of June in northern New England; they are borne on slender pubescent or tomentose peduncles half an inch to an inch and a half in length, often on the staminate plant furnished near the middle with two minute deciduous bractlets, or ebracteolate, the males in many-flowered dense or lax compound heads, the females in two to several-flowered clusters and sessile in the axil of a conspicuous often foliaceous bract and furnished with two smaller acute hairy bractlets. The calyx is oblong and slightly urceolate with a minutely five-toothed limb; the petals are thick, ovate-oblong, acute, rounded at the apex, erect or slightly spreading, and early deciduous; the stamens are exserted in the sterile flower, and in the fertile flower are shorter than the petals or are sometimes wanting; the stigma, of which there is no trace in the sterile flower, is stout, exserted, and reflexed above the middle. One to three fruits develop from a flower-cluster and ripen in October; they are ovoid, from a third to two thirds of an inch long, and dark blue, with thin and acid flesh; the stone is light brown, ovoid, pointed at the two ends, terete or more or less flattened, and ten or twelve-ribbed, with narrow distinct pale ribs rounded on the back, and thick hard walls. The seed is oblong, and is covered by a thin pale membranaceous coat.

Nyssa sylvatica is distributed from the valley of the Kennebec River in Maine to southern Ontario,[1] central Michigan, and southeastern Missouri,[2] and southward to the shores of the Kissimmee River and Tampa Bay in Florida, and to the valley of the Brazos River in Texas. In a large part of the region which it inhabits the Tupelo generally frequents the borders of swamps, growing in wet imperfectly drained soil in company with the Elm, the Swamp White Oak, the Scarlet Maple, the Hornbeam, and other water-loving trees; but in all the Alleghany region, where in North and South Carolina and Tennessee it attains its largest size, it is found on high wooded slopes associated with the White Oak, the Tulip-tree, the Cucumber-tree, the Buckeye, the Ash, the Sugar Maple, the Hickories, the Black Walnut, and the Wild Cherry.

The wood of *Nyssa sylvatica* is heavy, soft, strong, very tough, hard to split, difficult to work, inclined to check unless carefully seasoned, and not durable in contact with the soil; it is light yellow or nearly white, with thick lighter colored sapwood composed of eighty to a hundred layers of annual growth, and contains many thin medullary rays and numerous regularly distributed small open ducts. The specific gravity of the absolutely dry wood is 0.6353, a cubic foot weighing 39.59 pounds. It is employed for the hubs of wheels, rollers in glass factories, ox-yokes, shoes used to support horses on the rice-fields of the southern states, wharf-piles on the coast of the Gulf of Mexico, and sometimes for the soles of shoes.[3]

In the south Atlantic states, where the Tupelo often occupies small ponds in the Pine barrens, a well-marked variety occurs.[4] This is a tree thirty to forty feet in height, with a trunk gradually tapering upward from a swollen and much enlarged base, many erect thick roots rising above the

[1] Bell, *Rep. Geolog. Surv. Can.* 1879–80, 55°. — Burgess, *Bot. Gazette*, vii. 95. — Mocoun, *Cat. Can. Pl.* i. 192.

[2] Broadhead, *Bot. Gazette*, iii. 53.

[3] Porcher, *Resources of Southern Fields and Forests*, 347.

[4] *Nyssa sylvatica*, var. *biflora*.

Nyssa aquatica, Linnæus, *Spec.* 1058 (in part) (1753). — Wangenheim, *Beschreib. Nordam. Holz.* 86 (in part). — St. Hilaire, *Fam. Nat.* ii. 152. — Persoon, *Syn.* ii. 614. — Michaux f. *Hist. Arb. Am.* ii. 165, t. 22. — Roemer & Schultes, *Syst.* v. 76 (in part). — W. P. C. Barton, *Compend. Fl. Phil.* ii. 192. — Sprengel, *Syst.* i. 832. — Audubon, *Birds*, t. 133. — Elliott, *Sk.* ii. 684. — Dietrich, *Syn.* i. 878. — Spach, *Hist. Vég.* x. 464. — Chapman, *Fl.* 168. — Curtis, *Rep. Geolog. Surv. N. Car.* 1860, iii. 62.

Nyssa biflora, Walter, *Fl. Car.* 253 (1788). — Poiret, *Lam. Dict.* iv. 508. — Michaux, *Fl. Bor.-Am.* ii. 259. — Willdenow, *Spec.* iv. 1113 (in part); *Enum.* 1061; *Berl. Baumz.* ed. 2, 256. — Desfontaines, *Hist. Arb.* i. 37. — Gærtner f. *Fruct.* iii. 202, t. 216. — Aiton, *Hort. Kew.* ed. 2, v. 479. — Pursh, *Fl. Am. Sept.* i. 177. — Nuttall, *Gen.* ii. 236. — Poiret, *Lam. Dict.* Suppl. iv. 115. — Hayne, *Dendr. Fl.* 229. — Loudon, *Arb. Brit.* iii. 1317, f. 1195, 1196. — Coulter & Evans, *Bot. Gazette*, xv. 92.

This aquatic tree often appears distinct enough from the northern Tupelo, but the extreme forms are connected by others intermediate between the two in the shape and size of their leaves and in the shape and ridges of their stones.

surface of the water,[1] smaller and usually narrow acute or obtuse leaves, and flattened stones with more strongly developed ridges than usually occur on plants growing farther north.

A figure of doubtful identity which has been thought to represent *Nyssa sylvatica* was published by Plukenet in his *Phytographia*[2] in 1691; but the earliest authentic portrait and account of this tree are found in Catesby's *Natural History of Carolina*,[3] published in 1731. The Tupelo, according to Aiton,[4] was cultivated by the Duke of Argyll[5] near London in 1750.

In habit the Tupelo[6] is one of the most distinct, variable, and picturesque trees of eastern North America; the autumn coloring of its lustrous foliage equals in brilliancy that of the Scarlet Maple, the Sweet Gum, and the Flowering Dogwood, while its immunity from the attacks of disfiguring insects and serious fungal diseases heightens its value for the decoration of parks.

In cultivation the Tupelo flourishes in wet, undrained soil and on well-drained uplands. It is easily raised from seed, but its long hard roots, mostly destitute of small fibres, make it a difficult tree to transplant after it has been long established in one place.

[1] Wilson, *Proc. Phil. Acad.* 1889, 3.

[2] *Cynoxylum Americanum, folio crassiusculo molli & tenaci*, t. 172, f. 6; *Alm. Bot.* 127.

[3] *Arbor in aqua nascens, foliis latis acuminatis & non dentatis, fructu Eleagni minore*, i. 41, t. 41.

Nyssa foliis integerrimis, Linnæus, *Hort. Cliff.* 462.

Nyssa pedunculis multifloris, Clayton, *Fl. Virgin.* 121.

Nyssa foliis latis acuminatis non dentatis, fructu Elæagni minore, Romans, *Nat. Hist. Florida*, 29.

[4] *Hort. Kew.* iii. 446.

[5] See i. 108.

[6] *Nyssa sylvatica* is also known as Sour Gum and Black Gum. In New England, Tupelo, its Indian name, is most frequently given to this tree; in the middle states it is generally called Pepperidge, and in the south Sour Gum.

EXPLANATION OF THE PLATES.

PLATE CCXVII. NYSSA SYLVATICA.

1. A flowering branch of the sterile tree, natural size.
2. A flowering branch of the fertile tree, natural size.
3. A staminate flower, enlarged.
4. Vertical section of a staminate flower, enlarged.
5. A pistillate flower, enlarged.
6. Vertical section of a pistillate flower, enlarged.
7. A fruiting branchlet, natural size.
8. Vertical section of a fruit, enlarged.
9. A fruit cut crosswise, enlarged.
10. A stone, enlarged.
11. An embryo, much magnified.
12. A winter branchlet, natural size.

PLATE CCXVIII. NYSSA SYLVATICA, *var.* BIFLORA.

1. A flowering branch of the sterile tree, natural size.
2. A flowering branch of the fertile tree, natural size.
3. Vertical section of a sterile flower, enlarged.
4. Vertical section of a fertile flower, enlarged.
5. A fruiting branch, natural size.
6. A fruit cut crosswise, enlarged.
7. A stone, enlarged.

C.E. Faxon del.

Himely sc.

NYSSA SYLVATICA, Marsh.

A. Riocreux direx.t

Imp. R. Taneur, Paris.

C.E. Faxon del.

Himely sc.

NYSSA SYLVATICA, Var. BIFLORA, Sarg.

A. Riocreux direx.t

Imp. R. Taneur, Paris.

NYSSA OGECHE.

Ogeechee Lime. Sour Tupelo.

FRUIT large, the stone conspicuously winged. Leaves oblong-oval or obovate, usually acute at the apex.

Nyssa Ogeche, Marshall, *Arbust. Am.* 97 (1785). — Castiglioni, *Viag. negli Stati Uniti*, ii. 305. — Sargent, *Garden and Forest*, ii. 435. — Coulter & Evans, *Bot. Gazette*, xv. 93.

Nyssa capitata, Walter, *Fl. Car.* 253 (1788). — Poiret, *Lam. Dict.* iv. 508. — Michaux f. *Hist. Arb. Am.* ii. 257, t. 20. — Poiret, *Lam. Dict.* Suppl. v. 740. — Elliott, *Sk.* ii. 685. — Spach, *Hist. Vég.* x. 464. — Chapman, *Fl.* 168. — Koch, *Dendr.* ii. 456. — Lauche, *Deutsche Dendr.* ed. 2, 543. — Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix. 91.

Nyssa coccinea, W. Bartram, *Travels*, 17 (1791).

Nyssa tomentosa, Poiret, *Lam. Dict.* iv. 508 (1796).

Nyssa candicans, Michaux, *Fl. Bor.-Am.* ii. 259 (1803). — Persoon, *Syn.* ii. 614. — Desfontaines, *Hist. Arb.* i. 37. — Willdenow, *Spec.* iv. 1113. — Pursh, *Fl. Am. Sept.* i. 177. — Poiret, *Lam. Dict.* Suppl. iv. 116. — Nuttall, *Gen.* ii. 236. — Roemer & Schultes, *Syst.* v. 576. — Sprengel, *Syst.* i. 832. — Dietrich, *Syn.* i. 879. — Loudon, *Arb. Brit.* iii. 1318, f. 1199.

Nyssa montana, Gærtner f. *Fruct.* iii. 201, t. 216 (1805).

A bushy tree, forty to fifty feet in height, with a short trunk occasionally two feet in diameter and spreading branches which form a narrow round-topped head; or often a shrub sending up from the ground a cluster of small slender diverging stems. The bark of the trunk is an eighth of an inch thick, irregularly fissured, with a dark brown surface broken into thick appressed persistent plate-like scales. The branchlets, when they first appear, are coated with rufous tomentum, and during their first summer are light reddish brown, or green tinged with red, and puberulous; during their first winter they turn gray or reddish brown, and are marked by the large lunate or nearly triangular leaf-scars in which appear the ends of three groups of fibro-vascular bundles. The winter-buds are obtuse, an eighth of an inch long, and covered with ovate apiculate imbricated scales rounded on the back and clothed with thick hoary tomentum; those of the inner ranks lengthen on the growing shoots, and at maturity are ovate-oblong or obovate, rounded at the apex, bright red, and from one half to three quarters of an inch long. The leaves are oblong, oval or obovate, acute, rounded, or rarely obtuse and apiculate at the apex, gradually or abruptly wedge-shaped or sometimes rounded at the base, entire, deciduous; when they unfold they are covered on the lower surface with thick pale tomentum, and on the upper with short scattered appressed pale hairs; and at maturity they are thick and firm, dark green, rather lustrous and slightly pilose above, pale below, four to six inches long, and two to two and a half inches broad, with stout midribs and nine or ten pairs of primary veins covered on the lower side with rufous pubescence or often nearly glabrous, obscure reticulated veinlets, and stout grooved petioles from half an inch to an inch in length. The flowers are greenish yellow, and appear in March and April; the sterile are produced in capitate clusters on slender hairy peduncles, which are half an inch in length and furnished near the middle with two minute bractlets, and are developed from the axils of the inner scales of the terminal buds; the fertile are solitary on short stout woolly peduncles from the axils of bud-scales, and are furnished at the apex with two acute hairy bractlets. The sterile flowers are minute and are covered with long pale hairs on the outer surface of the short obscurely five-toothed calyx, and on the petals, which are oblong and rounded at the apex; the filaments are inserted under the margin of the thick pale pulvinate disk, and are longer than the petals; the anthers are oval and conspicuously tuberculate-roughened. The fertile flowers are a sixteenth of an inch long, with a deep cup-shaped calyx coated, like the minute rounded spreading petals, with hoary tomentum; the stamens which are

included, consist of short filaments and small mostly fertile anthers; the style is stout, exserted, and reflexed from near the base. The fruit, which ripens in July and August, sometimes hangs on the branches until after the falling of the leaves;[1] it is bright or dull red, oblong or obovate, glabrous, an inch to an inch and a half long, tipped with the thickened and pointed remnants of the style which remain attached to the stone, and is borne on a slender stem clothed with tomentum, enlarged at the apex, and one half or two thirds of an inch in length; the flesh is thick, juicy, and very acid; the stone is oblong, compressed, with thick hard walls produced into ten or twelve broad thin papery white wings, and is an inch or more in length and one or rarely two-seeded. The seed, which is compressed and narrowed at both ends, has a thin papery pale coat and thick albumen.

Nyssa Ogeche, which is a rare and local tree, grows in deep often inundated river-swamps from the borders of South Carolina in the neighborhood of the coast, through the Ogeechee valley in Georgia to Clay County in northern Florida, and in Washington County in western Florida, where it seems to attain its largest size.[2]

The wood of *Nyssa Ogeche* is light, soft, tough, although not strong, coarse-grained, and difficult to split. It contains many thin medullary rays and numerous regularly distributed open ducts, and is white, with thin hardly distinguishable sapwood composed of about ten layers of annual growth. The specific gravity of the absolutely dry wood is 0.4613, a cubic foot weighing 28.75 pounds.

A preserve with an agreeable subacid flavor, known as Ogeechee limes, is sometimes made from the fruit of this tree in Georgia and South Carolina.

The earliest mention of the Ogeechee Lime occurs in Bernard Romans' account of Florida, published in 1775;[3] it is said by Aiton[4] to have been introduced into England in 1806 by John Lyon,[5] but probably it does not now exist in cultivation outside the region it naturally inhabits, where it is occasionally found in gardens.

[1] "I saw large, tall trees of the Nyssa coccinea, si. Ogeeche, growing on the banks of the river. They grow in the water, near the shore. There is no tree that exhibits a more desirable appearance than this, in the autumn, when the fruit is ripe, and the tree divested of its leaves; for then they look as red as scarlet, with their fruit, which is of that colour also. It is of the shape, but larger than the olive, containing an agreeable acid juice." (W. Bartram, *Travels*, 17.)

[2] *Nyssa Ogeche* has been said to grow also in southern Arkansas (Nuttall, *Trans. Am. Phil. Soc.* v. 167; *Travels*, 71. — Lesquereux, *Owen 2d Rep. Geolog. Surv. Arkansas*, 364), where several trees once considered peculiar to the south Atlantic states are now known to occur, but I have seen no specimens gathered west of Florida. (See Coulter & Evans, *Bot. Gazette*, xv. 93.)

[3] *Nat. Hist. Florida*, 22.

[4] *Hort. Kew.* ed. 2, v. 480. — Loudon, *Arb. Brit.* iii. 1318, f. 1199.

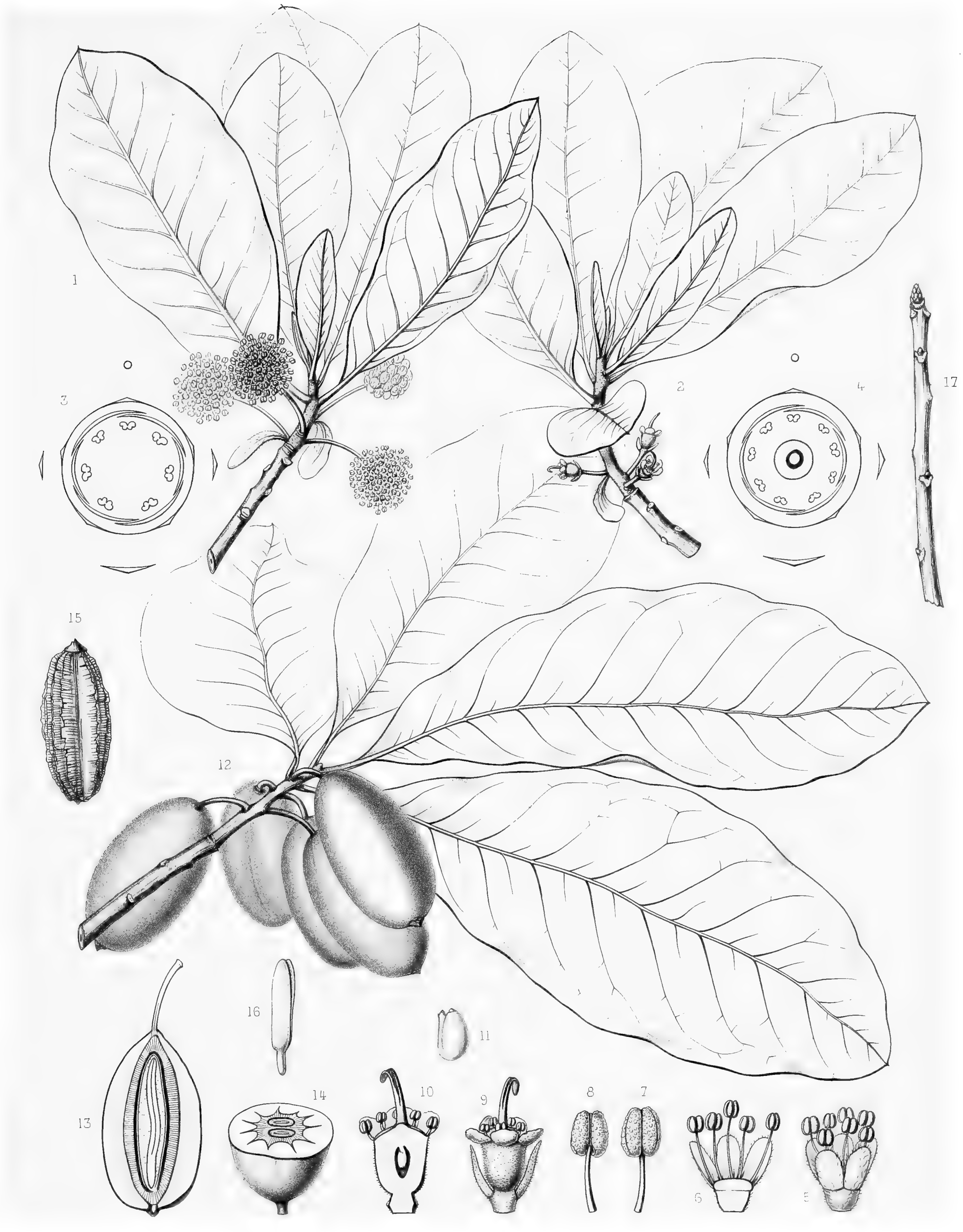
[5] Little is known of the early history of John Lyon, who is identified with American plants through his introduction of a number of important species into English gardens. He is said to have been a natural son of William Lyon of Gillogie in Forfarshire, Scotland, who was afterwards a merchant in London. Lyon probably came to America toward the end of the last century, as in 1802 he was placed in charge of the famous gardens at Woodlawn, near Philadelphia, the property of William Hamilton. He retained this position until 1805, and in the following year returned to England with a large collection of living plants and seeds, which were sold at auction near London. He probably soon returned to America, and, having devoted several years to exploring the Carolinas, Georgia, and Florida, returned in 1812 to England with another collection of plants. He again returned to America, where he died before 1818 at Asheville, North Carolina, where he was buried.

A number of species of Andromeda were united by Thomas Nuttall into the genus *Lyonia*, which commemorates "the name of the late Mr. John Lyon, an indefatigable collector of North American plants who fell victim to a dangerous epidemic amidst those savage and romantic mountains which had so often been the theatre of his labors" (*Gen.* i. 266).

EXPLANATION OF THE PLATE.

Plate CCXIX. Nyssa Ogeche.

1. A flowering branch of the sterile tree, natural size.
2. A flowering branch of the fertile tree, natural size.
3. Diagram of a staminate flower.
4. Diagram of a fertile flower.
5. A staminate flower, enlarged.
6. Vertical section of a staminate flower, enlarged.
7. An anther, front view, enlarged.
8. An anther, rear view, enlarged.
9. A pistillate flower, enlarged.
10. Vertical section of a pistillate flower, enlarged.
11. An ovule, much magnified.
12. A fruiting branch, natural size.
13. Vertical section of a fruit, natural size.
14. Cross section of a fruit, natural size.
15. A stone, natural size.
16. An embryo, natural size.
17. A winter branchlet, natural size.



C E. Faxon del.

Picart fr. sc.

NYSSA OGECHE, Marsh.

A. Riocreux direx.t

Imp. R. Taneur, Paris.

NYSSA AQUATICA.

Cotton Gum. Tupelo Gum.

FRUIT large, the stone acutely ridged. Leaves oval or oblong, acute or acuminate.

Nyssa aquatica, Marshall, *Arbust. Am.* 96 (1785). — Poiret, *Lam. Dict.* iv. 507. — Desfontaines, *Hist. Arb.* i. 36.

Nyssa aquatica, Linnæus, *Spec.* 1058 (in part) (1753).

Nyssa uniflora, Wangenheim, *Nordam. Holz.* 83, t. 27, f. 57 (1787). — Walter, *Fl. Car.* 253. — Elliott, *Sk.* ii. 686. — Chapman, *Fl.* 168. — Curtis, *Rep. Geolog. Surv. N. Car.* 1860, iii. 62. — Koch, *Dendr.* ii. 455. — Lauche, *Deutsche Dendr.* ed. 2, 543. — Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix. 92. — Coulter & Evans, *Bot. Gazette*, xv. 92. — Watson & Coulter, *Gray's Man.* ed. 6, 215.

Nyssa denticulata, Aiton, *Hort. Kew.* iii. 446 (1789). — Persoon, *Syn.* ii. 615. — Willdenow, *Spec.* iv. 1114. — Gærtner f. *Fruct.* iii. 203, t. 216. — Pursh, *Fl. Am. Sept.* i. 178. — Poiret, *Lam. Dict.* Suppl. iv. 115. — Nuttall, *Gen.* ii. 236. — Hayne, *Dendr. Fl.* 229. — Roemer & Schultes, *Syst.* v. 577. — Sprengel, *Syst.* i. 832. — Dietrich, *Syn.* i. 879.

Nyssa palustris, Salisbury, *Prodr.* 175 (1796).

Nyssa angulosa, Poiret, *Lam. Dict.* iv. 507 (1797); *Ill.* iii. 442, t. 851, f. 2. — Roemer & Schultes, *Syst.* v. 578.

Nyssa tomentosa, Michaux, *Fl. Bor.-Am.* ii. 259 (1803). — Persoon, *Syn.* ii. 615. — Willdenow, *Spec.* iv. 1113. — Pursh, *Fl. Am. Sept.* i. 177. — Nuttall, *Gen.* ii. 236. — Roemer & Schultes, *Syst.* v. 577. — Elliott, *Sk.* ii. 685. — Sprengel, *Syst.* i. 832. — Audubon, *Birds*, t. 13. — Dietrich, *Syn.* i. 879.

Nyssa angulisans, Michaux, *Fl. Bor.-Am.* ii. 259 (1803). — Dietrich, *Syn.* i. 879. — Spach, *Hist. Vég.* x. 465.

Nyssa grandidentata, Michaux f. *Hist. Arb. Am.* ii. 252, t. 19 (1812). — Loudon, *Arb. Brit.* iii. 1319, f. 1200, 1201.

Nyssa candicans, var. **grandidentata**, D. J. Browne, *Trees of America*, 426 (1846).

A tree, eighty to one hundred feet in height, with a trunk three or four feet in diameter above the greatly enlarged tapering base, comparatively small spreading branches which form a narrow oblong or pyramidal head, stout pithy branchlets, and thick corky roots. The bark of the trunk is a quarter of an inch thick, and is dark brown, longitudinally furrowed and roughened on the surface with small scales. The branches, when they first appear, are dark red and coated with fine pale tomentum; they soon become glabrous or nearly so, and in their first winter are light or bright red-brown and marked by small scattered pale lenticels and by conspicuous elevated nearly orbicular leaf-scars which show the ends of three large fibro-vascular bundles. The terminal buds are nearly globose, and are covered with broad ovate light chestnut-brown scales keeled on the back and rounded and apiculate at the apex; the scales of the inner ranks lengthen on the growing shoots, and at maturity are ovate-oblong, or obovate-oblong rounded at the apex, an inch or more in length, and bright yellow. The axillary buds are minute, obtuse, and nearly imbedded in the bark. The leaves are ovate-oblong, acute or acuminate and often long-pointed at the apex, wedge-shaped, rounded or subcordate at the base, entire or remotely and irregularly angulate-toothed, the teeth being often tipped with long slender mucros, and deciduous; when they unfold they are light red, coated below and on the petioles with thick pale tomentum, and pubescent above, especially on the midribs, and at maturity are thick and firm, dark green and lustrous on the upper surface, pale and more or less downy-pubescent on the lower, five to seven inches long and two to four inches wide, with broad thick midribs, about ten or twelve pairs of primary veins forked near the margin and connected by conspicuous cross veins, and stout grooved hairy petioles enlarged at the base and an inch and a half to two inches and a half in length. The flowers, which appear in March and April, are yellow-green and are borne on long slender hairy peduncles produced in the axils of the inner scales of the terminal bud, the sterile in dense capitate clusters, their peduncles furnished near the middle or occasionally at the apex with long linear ciliate bractlets, and the fertile solitary and surrounded by two to four strap-shaped scarious ciliate bractlets often half an inch in length and more

or less united below into an involucral cup. The calyx of the sterile flower is cup-shaped, obscurely five-toothed, and a third of the length of the oblong erect petals which are rounded at the apex and much shorter than the stamens. In the fertile flower the calyx is oblong and much longer than the ovate minute spreading petals; the stamens are included, with small mostly fertile anthers; the upper half of the stout tapering style is reflexed above the middle and revolute into a close coil. The fruit, which ripens in the early autumn, is oblong or slightly obovate, crowned with the pointed remnants of the style, dark purple, marked with conspicuous scattered pale dots, an inch long, and borne on slender drooping stalks three or four inches in length; the flesh is thin and acid, and is covered by a thick tough skin; the stone is ovate, pointed at the base, flattened, light brown or nearly white, thick-walled and about ten-ridged, the ridges being acute and wing-like with thickened separable margins and sometimes united by short intermediate ridges. The seed is compressed and pointed at both ends, with a pale thin coat and thin albumen.

Nyssa aquatica is distributed through the coast region of the Atlantic states from southern Virginia to northern Florida, through the Gulf states to the valley of the Nueces River in Texas, and through Arkansas and southern and southeastern Missouri to western Kentucky and Tennessee and to the valley of the lower Wabash River in Illinois. It is an inhabitant of deep swamps inundated during a part of every year, growing in great numbers with the Cypress, the Liquidamber, the Swamp White Oak, the Water Ash, the Scarlet Maple, the Water Locust, and the Cottonwood. In some parts of the country, especially in the valley of the lower Mississippi River, the Tupelo Gum is one of the largest and most abundant of the semiaquatic trees. It attains its greatest size in the Cypress swamps of western Louisiana and eastern Texas.

The wood of *Nyssa aquatica* is light, soft, not strong, close-grained, and difficult to split; it contains numerous thin medullary rays, and is light brown or often nearly white, with thick sapwood sometimes composed of more than a hundred layers of annual growth. The specific gravity of the absolutely dry wood is 0.5194, a cubic foot weighing 32.37 pounds. It is used in the manufacture of wooden-ware, broom-handles, and wooden shoes, and now largely for fruit and vegetable boxes;[1] the wood of the roots is sometimes used instead of cork for the floats of nets.

The first account of *Nyssa aquatica* appears in Catesby's *Natural History of Carolina.*[2] It was, perhaps, introduced by Catesby into English gardens, as according to Aiton[3] it was cultivated near London by Peter Collinson[4] in 1735. At the present time it is probably not to be found outside of its native swamps.

[1] *Garden and Forest*, ii. 122.

[2] *Arbor in aqua nascens, foliis latis acuminatis & dentatis, fructu Eleagni majore*, i. 60, t. 60. *Nyssa pedunculis unifloris*, Clayton, *Fl. Virgin.* 121.

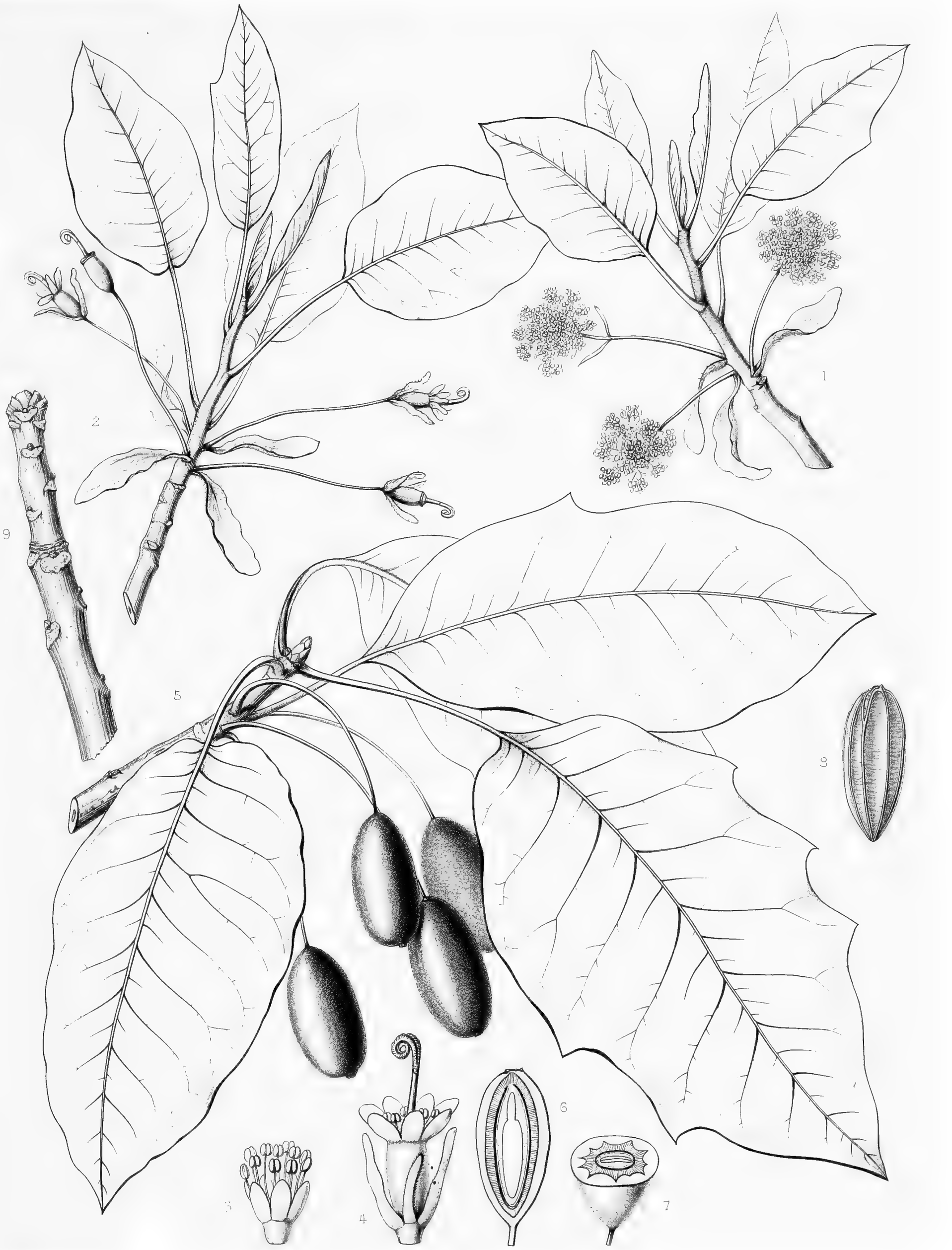
[3] *Hort. Kew.* iii. 447.

[4] See i. 8.

EXPLANATION OF THE PLATE.

PLATE CCXX. NYSSA AQUATICA.

1. A flowering branch of the sterile tree, natural size.
2. A flowering branch of the fertile tree, natural size.
3. A staminate flower, enlarged.
4. A pistillate flower, enlarged.
5. A fruiting branch, natural size.
6. Vertical section of a fruit, natural size.
7. Cross section of a fruit, natural size.
8. A stone, enlarged.
9. A winter branchlet, natural size.



C.E.Faxon del. *Picart fr. se.*

NYSSA AQUATICA, Marsh

A. Riocreux direx.t *Imp. R. Taneur, Paris*

SAMBUCUS.

FLOWERS regular, perfect or rarely polygamous; calyx 3 to 5-lobed or toothed; corolla gamopetalous, 3 to 5-parted, the divisions imbricated or rarely valvate in æstivation; stamens 5; ovary inferior or partly superior, 3 to 5-celled; ovules solitary, suspended. Fruit a berry-like drupe 3 to 5-stoned, the stones 1-seeded. Leaves opposite, unequally pinnate, destitute of stipules, deciduous.

Sambucus, Linnæus, *Gen.* 86 (1737). — Adanson, *Fam. Pl.* ii. 158. — A. L. de Jussieu, *Gen.* 214. — Endlicher, *Gen.* 569. — Meisner, *Gen.* 155. — Bentham & Hooker, *Gen.* ii. 3. — Baillon, *Hist. Pl.* vii. 501.

Phyteuma, Loureiro, *Fl. Cochin.* i. 138 (1790) (not Linnæus).

Tripetelus, Lindley, *Mitchell Three Exped. East Australia*, ii. 14 (1839). — Endlicher, *Gen.* Suppl. ii. 54. — Meisner, *Gen.* pt. ii. 360.

Trees or shrubs, with stout branches containing thick white or dark yellow-brown pith, scaly buds, and fibrous roots; or rarely perennial herbs. Leaves opposite, unequally pinnate, involute in vernation; leaflets serrate or laciniate, the base of the petioles naked, glandular or furnished with a stipule-like leaflet; stipels small, usually setaceous, often wanting. Bracts and bractlets lanceolate, acute, scarious, caducous, the bractlets sometimes wanting. Flowers small, articulate with slender pedicels, in broad terminal corymbose cymes. Calyx-tube adnate to the ovary, ovoid or turbinate, the limb three to five-lobed or toothed. Corolla rotate or slightly campanulate, equally three to five-parted, white, yellow, or light rose. Stamens inserted on the tube of the corolla, as many as its lobes and alternate with them; filaments filiform or subulate; anthers oblong, attached on the back, extrorse, versatile, two-celled, the cells opening longitudinally. Ovary inferior or partly superior, three to five-celled; style abbreviated, thick and conical, three to five-lobed and stigmatic at the apex; ovules solitary, suspended from the apex of the cell, resupinate; raphe dorsal; micropyle superior. Drupe baccate, subglobose, red, black, or rarely yellow, three to five-stoned, crowned with the remnants of the persistent stigmas; sarcocarp juicy; stones cartilaginous, punctate-rugulose, one-seeded. Seed oblong, compressed; testa membranaceous, adherent to the copious fleshy albumen. Embryo minute, near the hilum; cotyledons ovoid; radicle terete, erect.

Sambucus, with about twelve species, is now widely and generally distributed through the temperate parts of North America, Europe, and Asia; it inhabits high mountain ranges within the tropics of the two worlds, and Australia, Tasmania, and New Zealand. Of the four North American species,[1] the red-fruited *Sambucus racemosa*,[2] a tall shrub found in all the northern and mountainous regions of

[1] Gray, *Syn. Fl. N. Am.* i. pt. ii. 8.

[2] Linnæus, *Spec.* 270 (1753). — Gray, *Brewer & Watson Bot. Cal.* i. 278; *Syn. Fl. N. Am. l. c.* — Watson & Coulter, *Gray's Man.* ed. 6, 217.

Sambucus nigra, Thunberg, *Fl. Jap.* 126 (not Linnæus) (1784). — Debeaux, *Fl. Shangh.* 33.

Sambucus pubens, Michaux, *Fl. Bor.-Am.* i. 181 (1803). — Gray, *Man.* 173. — Emerson, *Trees Mass.* 361. — Chapman, *Fl.* 171.

Sambucus pubescens, Persoon, *Syn.* i. 328 (1805). — Pursh, *Fl. Am. Sept.* i. 204.

Sambucus pubens, var. *arborescens*, Torrey & Gray, *Fl. N. Am.* ii. 13 (1841).

Sambucus Williamsii, Hance, *Ann. Sci. Nat.* sér. 5, v. 217 (1866). — Franchet, *Pl. David.* i. 148.

the continent, is common also in northern Europe,[1] in northern Asia,[2] central China,[3] Corea, and Japan.[4] In Europe two other species occur; one of them, the herbaceous *Sambucus Ebulus*,[5] reaches Madeira, northern Africa, Asia Minor, and Cashmere, and perhaps reappears in southwestern China;[6] and the second, the arborescent *Sambucus nigra*,[7] extends also to the Orient.[8] In the elevated mountain valleys of Sikkim and Nepaul one endemic species is found.[9] *Sambucus Javanica*[10] ranges from Assam to the Malay peninsula, southern and central China, Java and Formosa, and perhaps to Japan. Two endemic species occur in Australasia;[11] and two arborescent species are described in the Floras of the Canary Islands[12] and Madeira.[13] One species inhabits the mountains of central and western South America from Guatemala to Peru,[14] and a species, possibly endemic, those of southern Mexico.[15]

Sambucus possesses cathartic and emetic properties in the bark; the flowers are excitant and sudorific, and the juice of the fruit is alterative and laxative. The fruit was used by the Romans to paint the statues of Jupiter red; the bark has been employed in dyeing.[16] The dried flowers of *Sambucus nigra* are used in Europe in the preparation of an aromatic distilled water and in flavoring lard, and by distilling the flowers small quantities of a light yellow fatty essential oil with a bitter burning but afterwards cooling flavor are obtained;[17] the leaves are employed to give a green tint to oil and fat,[18] and wine made from the juice of the ripe fruit is sometimes used in the United States and Europe as a beverage or to adulterate grape-juice.[19] The fruits of some of the species, especially of *Sambucus nigra*, and of *Sambucus glauca* of western America, are cooked and eaten.

The wood of *Sambucus nigra* is hard and compact, and is used by comb-makers and in mathematical instruments. The large pithy shoots furnish children with pop-guns, pipes, flutes, and whistles. In Europe *Sambucus nigra* often serves as a hedge plant and is a common inhabitant of cottage gardens. All the species produce handsome and abundant flowers and fruit, and are valuable ornamental plants. Forms with variously cut leaflets and with yellow or variegated foliage or abnormally colored fruit are favorites with horticulturists.

In North America Sambucus is not injured by insects and does not suffer seriously from fungal diseases.[20]

[1] Jacquin, *Icon. Pl. Rar.* i. t. 59. — Pallas, *Fl. Ross.* ii. 29. — *Nouveau Duhamel*, i. 249, t. 56. — Guimpel, Willdenow & Hayne, *Abbild. Deutsche Holz.* i. 45, t. 35. — De Candolle, *Prodr.* iv. 323. — Ledebour, *Fl. Ross.* ii. 383. — Nyman, *Conspect. Fl. Europ.* 321.

[2] Ledebour, *Fl. Alt.* i. 420. — Turczaninow, *Fl. Baicalensi-Dahurica*, i. 518. — Maximowicz, *Prim. Fl. Amur.* 135. — Franchet, *Pl. David.* i. 148.

[3] Forbes & Hemsley, *Jour. Linn. Soc.* xxiii. 348.

[4] Miquel, *Ann. Mus. Lugd. Bat.* ii. 265. — Franchet & Savatier, *Enum. Pl. Jap.* i. 198. — Miyabe, *Mem. Bost. Soc. Nat. Hist.* iv. 238 (*Fl. Kurile Islands*).

[5] Linnæus, *Spec.* 269 (1753). — *Fl. Dan.* vii. t. 1156. — De Candolle, *l. c.* 322. — Boissier, *Fl. Orient.* iii. 2. — Nyman, *l. c.* 321. — Hooker f. *Fl. Brit. Ind.* iii. 2.

[6] Forbes & Hemsley, *l. c.* — Franchet, *l. c.* ii. 68.

[7] Linnæus, *l. c.* (1753). — *Fl. Dan.* iv. t. 545. — *Nouveau Duhamel*, i. 245, t. 55. — De Candolle, *l. c.*

Sambucus vulgaris, Lamarck, *Fl. Franç.* iii. 369 (1778).

? Sambucus australis, Chamisso & Schlechtendal, *Linnæa*, iii. 140 (1828).

[8] Boissier, *l. c.*

[9] *Sambucus adnata*, De Candolle, *l. c.* (1830). — Hooker f. & Thomson, *Jour. Linn. Soc.* ii. 180. — Hooker f. *l. c.* 3.

[10] Blume, *Bijdr. Fl. Ned. Ind.* 657 (1825). — De Candolle, *l. c.* — Hasskarl, *Cat. Hort. Bog.* 117; *Regensburg Flora*, 1845, 243. — Miquel, *Fl. Ind. Bat.* ii. 124. — Hooker f. *l. c.* — Forbes & Hemsley, *l. c.*

Sambucus Chinensis, Lindley, *Trans. Hort. Soc. Lond.* vi. 297 (1826). — De Candolle, *l. c.* — Hance, *Ann. Sci. Nat.* sér. 5, v. 217; *Jour. Bot.* vii. 295; xii. 260. — Maximowicz, *Bull. Mosc.* 1879, 24.

Sambucus Thunbergiana, Miquel, *Ann. Mus. Lugd. Bat.* ii. 265 (1866). — Franchet & Savatier, *l. c.* — Franchet, *l. c.* i. 147.

[11] *Sambucus xanthocarpa*, F. Mueller, *Hooker Jour. Bot. & Kew Gard. Misc.* viii. 145 (1856); *Trans. Phil. Inst. Vict.* i. 42; *Pl. Vict.* t. 29. — Bentham, *Fl. Austral.* iii. 398.

Tripetelus Australasicus, Lindley, *Mitchell Three Exped. East Australia*, ii. 14 (1839).

Sambucus Gaudichaudiana, De Candolle, *l. c.* (1830). — Hooker f. *Fl. Tasman.* i. 164. — Bentham, *l. c.*

[12] *Sambucus Palmensis*, Link, *Buch Phys. Beschr. Canar. Ins.* 151 (1825). — Webb & Berthelot, *Phytogr. Canar.* sec. ii. 176, t. 78.

[13] *Sambucus Madeirensis*, Lowe, *Man. Fl. Mad.* 381 (1868).

[14] *Sambucus Peruviana*, Humboldt, Bonpland & Kunth, *Nov. Gen. et Spec.* iii. 429 (1818). — Kunth, *Syn. Pl. Æquin.* iii. 75. — De Candolle, *l. c.* 323. — Donnell Smith, *Pl. Guatemal.* No. 2191.

Sambucus graveolens, Roemer & Schultes, *Syst.* vi. 641 (1820).

[15] *Sambucus bipinnata*, Schlechtendal & Chamisso, *l. c.* v. 171 (1830). — Hemsley, *Bot. Biol. Am. Cent.* ii. 1.

[16] Loudon, *Arb. Brit.* ii. 1029.

[17] Spons, *Encyclopædia of the Industrial Arts, Manufactures, and Raw Commercial Products*, ii. 1420.

[18] Flückiger & Hanbury, *Pharmacographia*, 298. — *U. S. Dispens.* ed. 16, 1319.

[19] Loudon, *l. c.*

[20] *Sambucus Canadensis* is often attacked in early summer by the

Sambucus, the classical name of the Elder-tree, is believed to have been derived from σαμβύκη, a musical instrument, probably in allusion to the use of the pithy stems.

Rust, *Æcidium Sambuci*, Schweinitz. In its appearance this is one of the most striking of the Cluster Cups found in the eastern United States, and forms marked yellow distortions on the leaves, petioles, and young shoots, which when the fungus is luxuriant become bent and curved. Several other fungi occur on different species of Sambucus in the United States, although none of them are very conspicuous or cause serious diseases.

SYNOPSIS OF THE NORTH AMERICAN ARBORESCENT SPECIES.

Flowers in compound depressed 5 or 8-rayed cymes, the four external rays once to three times unequally 5-rayed, the central ray smaller, finally reduced to 3-flowered cymelets or to single flowers. Fruit blue-black; nutlets punctate-rugulose; pith white.

Leaves and young shoots more or less pubescent or cinero-canescent.

Fruit destitute of bloom . . . . . 1. SAMBUCUS CANADENSIS, var. MEXICANA.

Leaves and young shoots glabrous.

Fruit whitened with a glaucous bloom . . . . . 2. SAMBUCUS GLAUCA.

SAMBUCUS CANADENSIS, var. MEXICANA.

Elder.

LEAVES and young shoots more or less pubescent. Fruit destitute of bloom.

Sambucus Canadensis, var. **Mexicana.**

Sambucus Mexicana, De Candolle, *Prodr.* iv. 322 (1830). — Don, *Gen. Syst.* iii. 437. — Loudon, *Arb. Brit.* ii. 1030. — Gray, *Smithsonian Contrib.* v. 66 (*Pl. Wright.* ii.) (in part); *Brewer & Watson Bot. Cal.* i. 278; *Syn. Fl. N. Am.* i. pt. ii. 9. — Torrey, *Pacific R. R. Rep.* iv. 95; *Bot. Mex. Bound. Surv.* 71. — Rothrock, *Wheeler's Rep.* vi. 135. — Hemsley, *Bot. Biol. Am. Cent.* ii. 1. — Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix. 93. — Coulter, *Contrib. U. S. Nat. Herb.* ii. 155 (*Man. Pl. W. Texas*).

Sambucus glauca, Bentham, *Pl. Hartweg.* 313 (not Nuttall) (1848). — Gray, *Brewer & Watson Bot. Cal.* i. 278 (in part).

Sambucus velutina, Durand & Hilgard, *Jour. Phil. Acad.* n. ser. iii. 39 (1854); *Pacific R. R. Rep.* v. pt. iii. 8.

A tree, twenty-five to thirty feet in height, with a short trunk often abruptly enlarged at the base and sometimes a foot in diameter, and stout spreading branches which form a compact round-topped head. The bark of the trunk is a quarter of an inch thick, with a light brown surface tinged with red and broken into long narrow horizontal ridge-like scales. The branchlets, when they first appear, are light green, and like the young leaves are more or less covered with pale pubescence, or are glabrate or sometimes coated with canescent tomentum; at the end of the first year they become pale, or light brown tinged with red and roughened with elevated lenticels. The leaves are usually composed of five leaflets, and are borne on stout pubescent or glabrate petioles an inch or an inch and a half long and usually naked at the base; the leaflets are ovate-lanceolate, narrowed at the apex into long slender points, sharply serrate with incurved glandular-tipped teeth except at the base, which is entire and wedge-shaped or more or less unequally rounded on the two sides; at maturity they are dark yellow-green, pubescent especially on the broad midribs and primary veins, or nearly glabrous, thick and firm, an inch and a half to six inches long, half an inch to two and a half inches wide, increasing in size from the base to the apex of the leaf, and borne on slender petiolules which on the terminal leaflet are sometimes three quarters of an inch in length and on the lateral leaflets are much shorter; the stipels on vigorous shoots are sometimes a third of an inch long, ovate, acute and serrate, or on fertile branches, from which they are usually wanting, they are subulate or oblong and much smaller. The flowers, which are an eighth of an inch across, are produced in flat pubescent long-branched cymes six or eight inches across, and in the valley of the Rio Grande appear from March to July; the calyx is ovoid and five-lobed; the corolla is rotate, five-parted, and creamy white, with ovate-oblong divisions rounded at the apex; the style is ovate, thick, and fleshy. The fruit is a quarter of an inch in diameter, nearly black, rather juicy and destitute of bloom.

Sambucus Canadensis, var. *Mexicana*, is distributed from the valley of the Nueces River in western Texas through southern New Mexico and Arizona to southern California; it ranges southward through Mexico to Central America, and appears on the Sierra Nevada Mountains in Plumas County, California.[1] It frequents bottom-lands and the margins of streams, and is usually found growing in moist gravelly loam. From *Sambucus Canadensis*,[2] a common shrub distributed from New Brunswick

[1] The Mexican Elder was found here by Mrs. R. M. Austin, whose specimens are preserved in the Gray Herbarium at Cambridge.

[2] *Sambucus Canadensis*, Linnæus, *Spec.* 269 (1753). — Miller, *Dict.* ed. 8, No. 6. — Du Roi, *Harbk. Baumz.* ii. 414. — Moench, *Bäume Weiss.* 128. — Wangenheim, *Nordam. Holz.* 115. — Willdenow, *Berl. Baumz.* 355; *Spec.* i. pt. ii. 1494; *Enum.* 328. — Schmidt, *Oestr. Baumz.* iii. 22, t. 142. — *Nouveau Duhamel*, i. 248. — Michaux, *Fl. Bor.-Am.* i. 181. — Poiret, *Lam. Dict.* vii. 519. — Pursh, *Fl. Am. Sept.* i. 203. — Roemer & Schultes, *Syst.* vi. 640. — Elliott, *Sk.* i. 368. — Sprengel, *Syst.* i. 935. — De Candolle, *Prodr.* iv. 322. — Hooker, *Fl. Bor.-Am.* i. 279. — Don, *Gen. Syst.* iii. 437. — Loudon,

to the Saskatchewan and the mountains of Colorado, Utah, and Arizona, and southward to Florida and Texas, it differs in its arborescent habit and in the pubescent covering of the young shoots and leaves, although some of its glabrate forms are barely distinguishable from the northern plant.

The wood of *Sambucus Canadensis*, var. *Mexicana*, is light, soft, and coarse-grained; it contains numerous thin conspicuous medullary rays, and is light brown with thin lighter colored sapwood composed of two or three layers of annual growth. The specific gravity of the absolutely dry wood is 0.4614, a cubic foot weighing 28.75 pounds.

The Mexican Elder was first found in the United States by Mr. Charles Wright[1] in the valley of the lower Rio Grande in June, 1852. Its dense leafy head and large handsome flower-clusters make it a desirable ornamental tree, and in northern Mexico[2] and lower California[3] it is often found in the neighborhood of houses, where it is planted for shade and for the fruit, which is eaten by Mexicans and Indians.

Arb. Brit. ii. 1030, f. 776. — Dietrich, *Syn.* ii. 1009. — Torrey & Gray, *Fl. N. Am.* ii. 13. — Emerson, *Trees Mass.* 362. — Chapman, *Fl.* 171. — Koch, *Dendr.* ii. 71. — Gray, *Syn. Fl. N. Am.* i. pt. ii. 9. — Watson & Coulter, *Gray's Man.* ed. 6, 217.

Sambucus nigra, Marshall, *Arbust. Am.* 141 (1785) (not Linnæus).

Sambucus humilis, Rafinesque, *Ann. Nat.* 13 (1820); *Alsograph. Am.* 48.

Sambucus repens, Rafinesque, *Alsograph. Am.* 47 (1838).

Sambucus bipinnata, Rafinesque, *Alsograph. Am.* 47 (1838).

Sambucus glauca, Gray, *Smithsonian Contrib.* v. 66 (*Pl. Wright.* ii.) (1853) (not Nuttall).

[1] See i. 94.

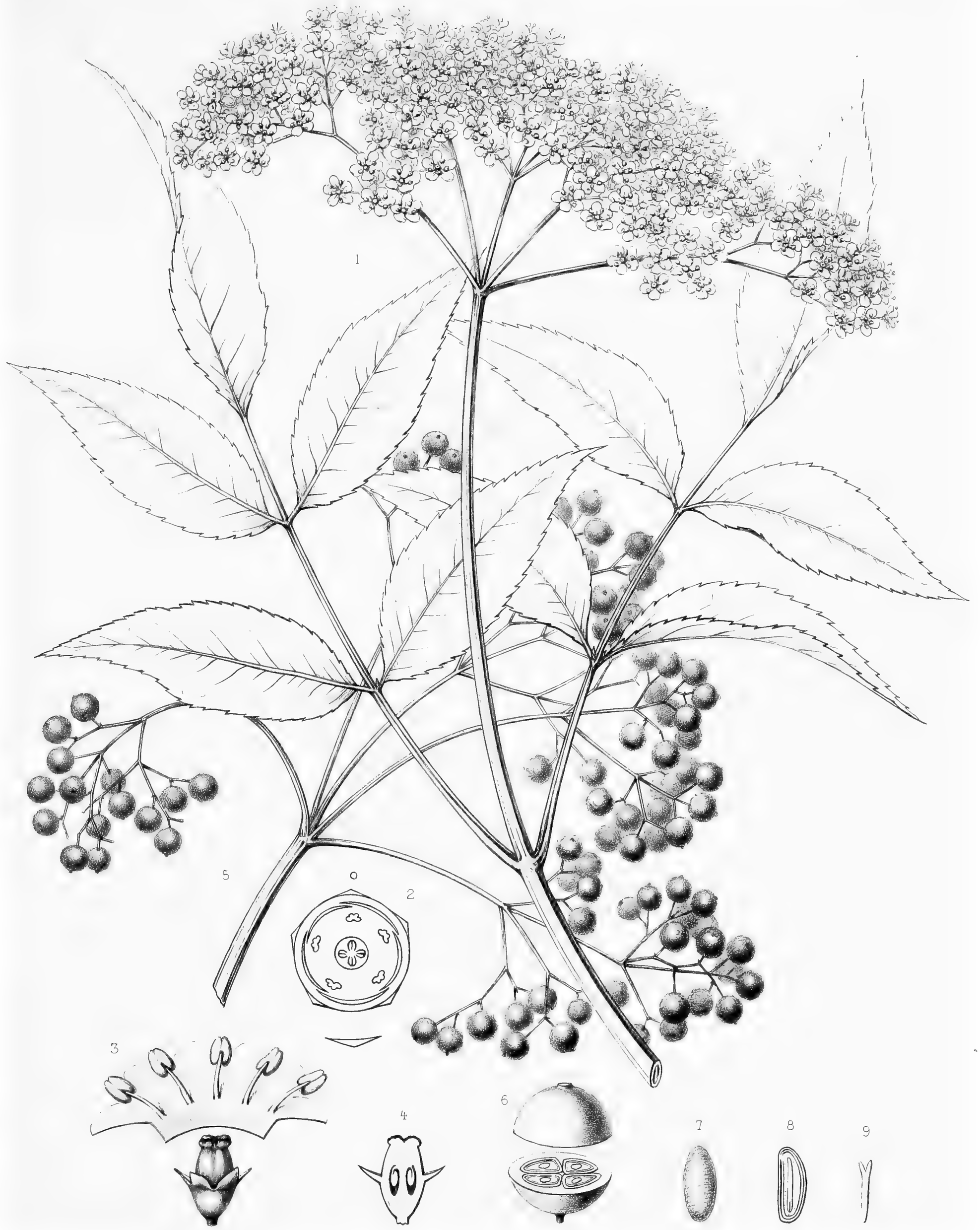
[2] C. G. Pringle, *Garden and Forest*, i. 106.

[3] Brandegee, *Proc. Cal. Acad.* ser. 2, iii. 224.

EXPLANATION OF THE PLATE.

PLATE CCXXI. SAMBUCUS CANADENSIS, var. MEXICANA.

1. A flowering branch, natural size.
2. Diagram of a flower.
3. A flower, the corolla displayed, enlarged.
4. Vertical section of a flower, the corolla and stamens removed.
5. A cluster of fruit, natural size.
6. A fruit, divided transversely, enlarged.
7. A stone, enlarged.
8. Vertical section of a stone, enlarged.
9. An embryo, much magnified.



C.E. Faxon del.

Rapine sc.

SAMBUCUS CANADENSIS Var. MEXICANA, Sarg.

A. Riocreux direx.t

Imp. R. Taneur, Paris.

SAMBUCUS GLAUCA.

Elder.

LEAVES and young shoots glabrous. Fruit covered with a glaucous bloom.

Sambucus glauca, Nuttall, *Torrey & Gray Fl. N. Am.* ii. 13 (1841). — Walpers, *Rep.* ii. 453. — Torrey, *Ives' Rep.* 15; *Bot. Mex. Bound. Surv.* 71. — Watson, *King's Rep.* v. 134. — Gray, *Brewer & Watson Bot. Cal.* i. 278 (in part); *Syn. Fl. N. Am.* i. pt. ii. 9. — Hall, *Bot. Gazette*, ii. 88. — Rothrock, *Wheeler's Rep.* vi. 135, 363. — Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix. 93. — Greene, *Fl. Francis.* 342.

? **Sambucus cerulea**, Rafinesque, *Alsograph. Am.* 48 (1838).

Sambucus Mexicana, Newberry, *Pacific R. R. Rep.* vi. pt. iii. 75 (1857) (not De Candolle).

Sambucus Californica, Koch, *Dendr.* ii. 72 (1872).

? **Sambucus callicarpa**, Greene, *Fl. Francis.* 342 (1892).

A tree, thirty to fifty feet in height, with a tall straight trunk sometimes enlarged at the base and twelve to eighteen inches in diameter, and stout spreading branches which form a compact round-topped head; or often a broad shrub sending up from the ground a number of spreading stems. The bark of the trunk is deeply and irregularly fissured, the dark brown surface being slightly tinged with red and broken into small square appressed scales. The branches, when they first appear, are green tinged with red or brown, and are covered with short scattered white hairs which soon disappear; in their first winter they are stout, slightly angled, covered with lustrous red-brown bark, and nearly encircled by the large triangular leaf-scars marked by five conspicuous fibro-vascular bundle-scars. Terminal buds are rarely formed, owing to the premature death of the tips of the shoots, which continue to grow late in the autumn. The axillary buds are generally in pairs, superposed, or in clusters of four or five, only the upper bud or sometimes the lower usually developing; they are covered with two or three pairs of opposite broadly ovate chestnut-brown scales persistent on the base of the growing shoot until it is nearly a foot long; those of the inner rank are accrescent and at maturity are acute, entire, green, and an inch in length, or sometimes develop into pinnate leaves two or three inches long. The leaves are composed of from five to nine leaflets, and are borne on stout grooved petioles much enlarged and naked or sometimes furnished at the base with leaf-like appendages; the leaflets are ovate or narrowly oblong, contracted at the apex into long narrow points, unequally wedge-shaped or rounded at the base, and coarsely serrate with spreading or slightly incurved callous-tipped teeth; the lower ones are often three-parted or pinnate, and the terminal one is sometimes furnished with one or two lateral stalked leaflets; when they unfold they are yellow-green on the upper, and pale on the lower surface, and, like the leaf-stalks, are covered with scattered pale hairs; at maturity they are glabrous, thin, rather firm in texture, bright green above and pale below, two to six inches long, and half an inch to an inch and a half wide, with narrow pale midribs, inconspicuous veins, and slender petiolules which are a quarter of an inch to half an inch in length on the lateral leaflets and sometimes an inch and a half to two inches in length on the terminal leaflet. The stipels, which are often suppressed, vary from a sixteenth of an inch to half an inch in length, and are oblong-lanceolate, rounded or acute at the apex, entire and caducous. The flowers, which appear in April in southern California, and in June and July in Washington and British Columbia, are produced in flat long-branched glabrous cymes four to six inches in width, with linear acute green caducous bracts and bractlets, the lower branches being often produced from the axils of upper leaves. The flower-buds are globose and covered with a glaucous bloom, and sometimes turn red before opening. The flowers, which are an eighth of an inch across, have an ovoid red-brown calyx with acute scarious lobes, a rotate yellowish white corolla with oblong divisions rounded at the apex and as long as the stamens, and a thick fleshy conical style. The fruit is subglobose, a

quarter of an inch in diameter, tipped with the remnants of the stigmas, blue-black, whitened with a thick mealy bloom, and rather sweet and juicy.

Sambucus glauca is distributed from the valley of the lower Fraser River and Vancouver's Island[1] to the southern borders of California, and eastward to the Blue Mountains of Oregon and the Wasatch Mountains of Utah. It is an inhabitant of valleys, where it usually grows in rather dry gravelly soil. Very abundant in the coast region, and comparatively rare in the interior, it attains its greatest size in the valleys of western Oregon, while farther north, and east of the Cascade and Sierra Nevada Mountains, it rarely assumes the habit of a tree.

The wood of *Sambucus glauca* is light, soft, weak, and coarse-grained. It contains numerous rather conspicuous medullary rays, and is yellow tinged with brown, with thin lighter colored sapwood. The specific gravity of the absolutely dry wood is 0.5087, a cubic foot weighing 31.70 pounds.

Sambucus glauca was first noticed in eastern Oregon by members of the party which crossed the continent early in the century under the leadership of Lewis and Clark.[2] It is occasionally planted[3] in the Pacific states for ornament, and for the sake of its fruit, which is reputed to be of better quality than that of the other species and is largely used in pies and preserves.[4]

[1] Macoun, *Cat. Can. Pl.* pt. iv. 331.

[2] "The Alder, which is also common to our country, was found in great abundance in the woodlands, on this side of the Rocky Mountains. It differs in the color of its berry: this being of a pale sky blue, while that of the United States is of a deep purple." (*History of an Expedition under the command of Captains Lewis & Clark to the Sources of the Missouri, thence across the Rocky Mountains and down the River Columbia to the Pacific Ocean*, ii. 160.)

This description probably refers to the Oregon Elder. Upon the strength of it Rafinesque published in 1838 (*Alsograph. Am.* 48) his *Sambucus cerulea*, the name which, if the identity of his plant could be satisfactorily determined, would replace the later *Sambucus glauca* of Nuttall.

[3] A specimen planted in Jacksonville, Oregon, in 1859 or 1860, is described in *Garden and Forest* (iii. 508). In 1890 its trunk, which was much swollen at the base, had a circumference of eleven feet nine inches at the ground, and three feet higher up girted seven feet two inches; the branches spread thirty-three feet, and the total height of the tree was forty feet.

[4] Wickson, *California Fruits and How to Grow Them*, ed. 2, 65.

EXPLANATION OF THE PLATE.

PLATE CCXXII. SAMBUCUS GLAUCA.

1. A flowering branch, natural size.
2. Vertical section of a flower, enlarged.
3. A stamen, enlarged.
4. An ovule, much magnified.
5. A cluster of fruit, natural size.
6. Cross section of a fruit, enlarged.
7. Vertical section of a fruit, enlarged.
8. A nutlet, enlarged.
9. Vertical section of a nutlet, enlarged.
10. An embryo, much magnified.
11. A winter branchlet, natural size.

C.E Faxon del. Rapine sc.

SAMBUCUS GLAUCA, Nutt.

A. Riocreux direx.t Imp. R. Taneur, Paris.

VIBURNUM.

FLOWERS perfect or neutral; calyx equally 5-toothed, persistent; corolla gamopetalous, 5-lobed, the lobes imbricated in æstivation; stamens 5; ovary inferior, 1-celled; ovules solitary, suspended. Fruit a dry or fleshy 1-seeded drupe. Leaves simple, usually opposite, stipulate or destitute of stipules.

Viburnum, A. L. de Jussieu, *Gen.* 213 (1789). — Meisner, *Gen.* 155. — Endlicher, *Gen.* 569. — Örsted, *Videnskab. Medd. fra Nat. For. Kjobenh.* 1860, 295 (excl. *Tinus*). — Bentham & Hooker, *Gen.* ii. 3. — Baillon, *Hist. Pl.* vii. 502. — Engler & Prantl, *Pflanzenfam.* iv. pt. iv. 163.

Tinus, Linnæus, *Gen.* 85 (1737). — Adanson, *Fam. Pl.* ii. 158. — Örsted, *Videnskab. Medd. fra Nat. For. Kjobenh.* 1860, 303.

Viburnum, Linnæus, *Gen.* 86 (1737). — Adanson, *Fam. Pl.* ii. 158.

Opulus, Linnæus, *Gen.* 86 (1737).

Lentago, Rafinesque, *Ann. Gén. Sci. Phys.* vi. 87 (1820).

Thyrsosma, Rafinesque, *Sylva Tellur.* 130 (1838).

Oreinotinus, Örsted, *Videnskab. Medd. fra Nat. For. Kjobenh.* 1860, 281, t. 6, f. 11–25.

Microtinus, Örsted, *Videnskab. Medd. fra Nat. For. Kjobenh.* 1860, 293, t. 6, f. 7–10.

Solenotinus, Örsted, *Videnskab. Medd. fra Nat. For. Kjobenh.* 1860, 294, t. 6, f. 1–4.

Small trees or shrubs, with tough flexible branchlets, naked or scaly buds, and fibrous roots. Leaves opposite or very rarely verticillate, petiolate, involute in vernation, entire, serrate or dentate, deciduous or persistent; stipules obsolete or minute, or conspicuous and rarely ample. Bracts and bractlets minute, lanceolate, acute, caducous. Flowers articulate with the short bracteolate or bibracteolate pedicels, white or rose color, in terminal or axillary umbel-like flat or panicled cymes, the cymes sometimes radiate with large neutral ray-flowers. Calyx-tube turbinate or sub-cylindrical, the limb short, equally five-lobed, persistent. Corolla tubular, turbinate or rotate, equally five-lobed, the lobes spreading and reflexed after anthesis. Stamens five, inserted on the base of the corolla alternate with its lobes, in one or rarely two series; filaments filiform or subulate, exserted, short or elongated; anthers oblong, attached on the back below the middle, introrse, versatile, two-celled, the cells opening longitudinally. Ovary inferior, one or at first incompletely two to three-celled; style capitate, conical, short, divided at the apex into three stigmatic lobes; ovules solitary, suspended from the apex of the interior angle of the cell, resupinate; raphe dorsal; micropyle superior. Fruit ovoid or globose, terete or compressed, one or incompletely two to three-celled, crowned with the persistent limb of the calyx and with the remnants of the style, dry or fleshy, the flesh sweet, acidulous, or oily; stone coriaceous, chartaceous or corneous, ovate or orbicular, flattened or globose, smooth or marked with longitudinal grooves or ridges. Seed oblong, compressed, concave on the ventral face or slightly winged or incurved on the margin; testa membranaceous, adherent to the copious fleshy or ruminate albumen. Embryo minute, near the hilum; cotyledons ovate; radicle terete, erect.[1]

[1] Viburnum may be divided into the following sections: —

Exterior flowers of the corymb neutral.

OPULUS. Cymes radiate or uniform; leaves deciduous, their petioles often biglandular at the apex, stipulate; buds naked or scaly; fruit red or black, 1-celled.

Flowers all perfect; buds scaly.

LENTAGO. Flowers in terminal umbel-like cymes; corolla rotate, funnel-form or tubular; drupe 1-celled; endocarp flattened; albumen fleshy, homogeneous.

TINUS. Flowers in umbel-like cymes; corolla rotate; drupe dry, 1-celled; endocarp subterete; albumen ruminate; leaves coriaceous.

MICROTINUS. Flowers in paniculate cymes; corolla campanulate-rotate or salver-shaped; drupe imperfectly 2-celled; endocarp compressed, its margins incurved; albumen fleshy, homogeneous.

OREINOTINUS. Flowers in umbel-like cymes; corolla campanulate-rotate; drupe imperfectly 3-celled; albumen fleshy, homogeneous.

SOLENOTINUS. Flowers in paniculate cymes; corolla tubular, elongated, with a spreading limb; drupe imperfectly 3-celled; endocarp flattened; albumen fleshy, homogeneous.

Viburnum, with about eighty species, is now widely and generally distributed through the temperate regions of the northern hemisphere; it inhabits the mountain ranges of central and western South America and the West Indies,[1] and occurs on several islands of the East Indian Archipelago[2] and in Madagascar.[3] In America where, north of Mexico, fourteen species are found,[4] only one is endemic in the region west of the Rocky Mountains.[5] Of the North American species, two are small trees. Judging by the number of described species, the centre of distribution of the genus is in southern Mexico and Central America.[6] It is well represented in China,[7] Japan,[8] and India,[9] where a number of shrubby species occur; there are fewer species in the Orient,[10] and in Europe[11] only three are recognized, including *Viburnum Opulus*,[12] which grows in profusion in the boreal regions of the three northern continents. In the cretaceous epoch Viburnum inhabited the Arctic regions and afterward spread through Europe and North America,[13] abounding in the central and western parts of this continent,[14] where it is less common and less multiplied in species at present than in other northern regions.

Viburnum has few useful properties. The leaves and fruit of some of the species are astringent,[15] and those of the European *Viburnum Lantana*[16] are used in dyeing and for making ink.[17] The bark of the North American arborescent *Viburnum prunifolium* is used in medicine; and the bark and leaves of several of the American species are said to have been employed by the Indians and in early domestic practice in the treatment of various diseases.[18] The wood of *Viburnum Opulus* produces charcoal valued in the manufacture of gunpowder;[19] and in America the bark is sometimes employed as a tonic and antispasmodic,[20] and the fruit is occasionally eaten.[21] Many of the species produce beautiful flowers and fruit, and are prized in gardens where the Laurustinus, *Viburnum Tinus*,[22] has been cultivated since the time of the ancients.

In North America Viburnum is not seriously injured by insects[23] or fungal diseases.[24]

[1] Grisebach, *Fl. Brit. W. Ind.* 315.

[2] Miquel, *Fl. Ind. Bat.* ii. 119.

[3] Bentham & Hooker, *Gen.* ii. 3.

[4] Gray, *Syn. Fl. N. Am.* i. pt. ii. 9.

[5] *Viburnum ellipticum*, Hooker, *Fl. Bor.-Am.* i. 280 (1833). — Torrey & Gray, *Fl. N. Am.* ii. 15. — Gray, *Brewer & Watson Bot. Cal.* i. 278; *Syn. Fl. N. Am. l. c.* 10.

[6] Örsted, *Videnskab. Medd. fra Nat. For. Kjobenh.* 1860, 280. — Hemsley, *Bot. Biol. Am. Cent.* ii. 2.

[7] Maximowicz, *Bull. Acad. Sci. St. Pétersbourg*, xxvi. 474 (*Mél. Biol.* x. 644).

[8] Franchet & Savatier, *Enum. Pl. Jap.* i. 199.

[9] Brandis, *Forest Fl. Brit. Ind.* 257. — Hooker f. *Fl. Brit. Ind.* iii. 3.

[10] Boissier, *Fl. Orient.* iii. 3.

[11] Nyman, *Conspect. Fl. Europ.* 320.

[12] Linnæus, *Spec.* 268 (1753). — *Fl. Dan.* iv. t. 661. — Schmidt, *Oestr. Baumz.* iii. 47, t. 173, 174. — *Nouveau Duhamel* ii. 132, t. 39. — Guimpel, Willdenow & Hayne, *Abbild. Deutsch. Holz.* i. 42, t. 32. — De Candolle, *Prodr.* iv. 328. — Maximowicz, *l. c.* 492 (*l. c.* 670). — Gray, *Syn. Fl. N. Am. l. c.* — Forbes & Hemsley, *l. c.* 354. — Watson & Coulter, *Gray's Man.* ed. 6, 217.

Viburnum Americanum, Miller, *Dict.* ed. 8, No. 8 (1768).

Viburnum trilobum, Marshall, *Arbust. Am.* 162 (1785).

Viburnum Opulus Americanum, Aiton, *Hort. Kew.* i. 373 (1789).

Viburnum Opulus Europeanum, Michaux, *Fl. Bor.-Am.* i. 180 (1803).

Viburnum Opulus Pimina, Michaux, *l. c.* (1803). — Rafinesque, *Alsograph. Am.* 57.

Viburnum Opulus edule, Michaux, *l. c.* (1803).

Viburnum Oxycoccus, Pursh, *Fl. Am. Sept.* i. 203 (1814).

Viburnum edule, Pursh, *l. c.* (1814).

Viburnum Opulus Pimina, var. *subcordatum*, Rafinesque, *l. c.* 58 (1838).

[13] Saporta, *Origine Paléontologique des Arbres*, 244. — Zittel, *Handb. Palæontolog.* ii. 789, f. 402, 403.

[14] Lesquereux, *Rep. U. S. Geolog. Surv.* viii. 230 (*Contrib. Foss. Fl. W. Terr.* pt. iii.). — L. F. Ward, *6th Ann. Rep. U. S. Geolog. Surv.* 1884–85, 556 (*Syn. Fl. Laramie Group*).

[15] Baillon, *Hist. Pl.* vii. 382.

[16] Linnæus, *l. c.* (1753). — Schmidt, *l. c.* 47, t. 175. — *Nouveau Duhamel*, ii. 130, t. 103. — Guimpel, Willdenow & Hayne, *l. c.* 41, t. 31. — De Candolle, *l. c.* 326.

Viburnum tomentosum, Lamarck, *Fl. Franç.* iii. 363 (1778).

[17] Loudon, *Arb. Brit.* 1036, f. 785.

[18] Rafinesque, *Med. Fl.* ii. 274.

[19] Baillon, *l. c.* 388.

[20] Johnson, *Man. Med. Bot. N. Am.* 164. — *U. S. Dispens.* ed. 16, 1586.

[21] Richardson, *Arctic Searching Exped.* ii. 220.

[22] Linnæus, *l. c.* 267 (1753). — Schmidt, *l. c.* 50, t. 180. — *Nouveau Duhamel*, ii. 126, t. 37. — De Candolle, *l. c.* 324. — Loudon, *l. c.* 1032, f. 778.

[23] The foliage of *Viburnum Opulus*, especially of the sterile form, the Snowball of gardens, is often seriously injured by *Aphis Viburni*, Scopoli, which causes the leaves to curl up and twist. Larvæ of *Hyphantria cunea*, Drury, occasionally disfigure the foliage of different species in the United States; and *Coleophora viburniella*, Clemens, sometimes mines within the parenchyma of the leaves (*Proc. Ent. Soc. Phil.* i. 79).

[24] In North America two fungi of the Rust family are known on species of Viburnum, *Coleosporium Viburni*, Arthur, on *Viburnum Lentago* in the western states, and *Puccinia Linkii*, Klotzsch, on

Viburnum, the classical name of *Viburnum Lantana*, was adopted by Tournefort[1] as the name of the genus, from which he distinguished Opulus and Tinus.

Viburnum pauciflorum, Torrey & Gray, in Newfoundland and Canada. A mildew, *Microsphæra Alni*, Winter, is common in different parts of the country on the leaves of *Viburnum Lentago* and *Viburnum prunifolium*, and on those of some of the shrubby species; and *Massaria Corni*, Saccardo, has been noticed on several species.

[1] *Inst.* 607, t. 376–378.

SYNOPSIS OF THE NORTH AMERICAN ARBORESCENT SPECIES.

Flowers in sessile compound many-flowered cymes of three to five cymose rays subtended by the upper leaves; calyx tubular. Fruit black or bluish black, sweet and fleshy; stones cartilaginous, oval or orbicular, flattened, without ridges; albumen fleshy. Leaves without stipules. Winter-buds scaly, their scales accrescent and foliaceous.

Leaves ovate, acuminate, their petioles generally undulate-margined or winged. Winter-buds long-pointed . . . . . 1. V. LENTAGO.

Leaves ovate, oval or suborbicular, their petioles usually naked. Winter-buds short-pointed or obtuse, coated with rufous pubescence . . . . . 2. V. PRUNIFOLIUM.

VIBURNUM LENTAGO.

Sheepberry. Nannyberry.

LEAVES ovate, acuminate, their petioles usually undulate-margined or winged. Winter-buds long-pointed.

Viburnum Lentago, Linnæus, *Spec.* 268 (1753). — Marshall, *Arbust. Am.* 161. — Du Roi, *Harbk. Baumz.* ii. 485. — Moench, *Bäume Weiss.* 140, t. 8. — Wangenheim, *Nordam. Holz.* 100. — Walter, *Fl. Car.* 116. — Willdenow, *Berl. Baumz.* 402; *Spec.* i. pt. ii. 1491; *Enum.* 327. — Schmidt, *Oestr. Baumz.* iii. 48, t. 176. — *Nouveau Duhamel*, ii. 129. — Schkuhr, *Handb.* i. 234. — Michaux, *Fl. Bor.-Am.* i. 178. — Persoon, *Syn.* i. 327. — Poiret, *Lam. Dict.* viii. 658. — Desfontaines, *Hist. Arb.* i. 344. — Du Mont de Courset, *Bot. Cult.* ed. 2, iv. 341. — Pursh, *Fl. Am. Sept.* i. 201. — Bigelow, *Fl. Boston.* 70. — Nuttall, *Gen.* i. 202. — Hayne, *Dendr. Fl.* 37. — Roemer & Schultes, *Syst.* vi. 637. — Elliott, *Sk.* i. 365. — Torrey, *Fl. N. Y.* i. 305. — Watson, *Dendr. Brit.* i. 21, t. 21. — Sprengel, *Syst.* i. 934. — Guimpel, Otto & Hayne, *Abbild. Holz.* 125, t. 102. — De Candolle, *Prodr.* iv. 325. — Hooker, *Fl. Bor.-Am.* i. 279. — Don, *Gen. Syst.* iii. 440. — Rafinesque, *Alsograph. Am.* 55. — Spach, *Hist. Vég.* viii. 311. — Dietrich, *Syn.* ii. 1011. — Torrey & Gray, *Fl. N. Am.* ii. 15. — Emerson, *Trees Mass.* 364. — Darlington, *Fl. Cestr.* ed. 3, 115. — Örsted, *Videnskab. Medd. fra Nat. For. Kjobenh.* 1860, 301. — Chapman, *Fl.* 171. — Engelmann, *Trans. St. Louis Acad.* ii. 269. — Koch, *Dendr.* ii. 62. — Ridgway, *Proc. U. S. Nat. Mus.* 1882, 68. — Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix. 94. — Lauche, *Deutsche Dendr.* ed. 2, 206. — Gray, *Syn. Fl. N. Am.* i. pt. ii. 12. — Watson & Coulter, *Gray's Man.* ed. 6, 219.

Viburnum pyrifolium? Bigelow, *Fl. Boston.* ed. 2, 116 (1824).

A bushy tree, twenty to thirty feet in height, with a short trunk eight or ten inches in diameter, slender rather pendulous flexible branches which form a compact round-topped head, thin divergent branchlets, and bad-smelling wood. The bark of the trunk is reddish brown and irregularly broken into small thick plates divided on their surface into minute thin appressed scales. The branchlets, when they first appear, are light green and slightly covered with rufous pubescence, and in their first winter are slender, light red, scurfy, and marked by occasional dark orange-colored lenticels and by narrow leaf-scars in which appear three conspicuous fibro-vascular bundle-scars; in their second year they become dark reddish brown and are sometimes covered with a slight glaucous bloom. The winter-buds, which are light red and generally covered with pale scurfy pubescence, are protected by a pair of opposite scales; those which contain flower-bearing branchlets are three quarters of an inch in length, obovate, much swollen below the middle, and then abruptly contracted into long narrow tapering points, and are subtended by two minute lateral buds formed in the axils of the last leaves of the previous year and generally abortive; the terminal buds inclosing sterile shoots are lanceolate, acute, slightly angled, and about half an inch long; the axillary buds are acute, flattened by pressure against the stem, and much smaller than the terminal buds. The bud-scales in enlarging and unfolding become lanceolate, rounded on the back, often slightly expanded and leaf-like at the apex, light purple, reflexed above the middle, and an inch or an inch and a half in length, or often develop into leaf-like bodies which only differ from the leaves in their smaller size, shorter blades, and broad boat-like petioles covered on the outer surface with scurfy pubescence, and which sometimes do not fall until the flowers open. The leaves are ovate and usually acuminate, with short or elongated points, or are sometimes rounded at the apex, wedge-shaped, rounded or subcordate at the base, and sharply serrate with incurved callous-tipped teeth; when they unfold they are bronze green and lustrous, coated on both surfaces of the midribs and on the petioles with thick rufous pubescence, slightly pilose on the upper surface, and covered on the lower with short pale hairs; at maturity they are bright green and lustrous above, yellow-green and marked with minute black dots below, two and a half to three inches long and an inch to an inch and a

half broad, with slender midribs, primary veins connected by conspicuous reticulate veinlets, and broad grooved more or less interruptedly winged or often wingless petioles which vary from an inch to an inch and a half in length, and on the first pair of leaves are broader, boat-shaped, and covered with thick rufous tomentum. In the autumn the leaves turn a deep vinous red or red and orange-color before falling. The flowers are slightly fragrant, and appear from the middle of April to the first of June in stout-branched scurfy flat cymes from three to five inches in diameter. The bracts and bractlets are nearly triangular, a sixteenth of an inch long, green, and caducous. The flower-buds are globose and light yellow-green. The flowers, which are borne on slender pedicels bibracteolate at the apex, have a slender ovoid calyx-tube with minute triangular acute lobes, a pale cream-colored or nearly white corolla a quarter of an inch across when expanded, with ovate lobes acute and slightly erose at the apex, exserted stamens with slender filaments and bright yellow anthers, and a thick ovate light green style crowned with a broad stigma. The fruit, which ripens in September, is borne on slender drooping stalks in red-stemmed few-fruited clusters; it is oval, thick-skinned, sweet and rather juicy, black or dark blue, and covered with a glaucous bloom.

Viburnum Lentago is distributed in British America from the valley of the Rivière du Loup in the province of Quebec to the Saskatchewan,[1] and ranges southward through the northern states and along the Alleghany Mountains to northern Georgia, and westward in the United States to southern Indiana, southwestern Missouri, and eastern Nebraska.[2] It is a common plant, usually growing on rocky hillsides in moist ground, along the borders of the forest, or near the banks of streams and the margins of swamps in wet peaty soil, and in northern New England often springing up in fence-rows and along the margins of roadsides.

The wood of *Viburnum Lentago* is heavy, hard, and close-grained, and contains thin barely distinguishable medullary rays. It is dark orange-brown in color, with thin nearly white sapwood. The specific gravity of the absolutely dry wood is 0.7303, a cubic foot weighing 45.51 pounds.

Viburnum Lentago appears to have been discovered by Peter Kalm,[3] the Swedish naturalist, who traveled in America in the middle of the last century. According to Aiton,[4] it was cultivated in England in 1761 by the nurseryman James Gordon.[5]

The Sheepberry is one of the largest of the Viburnums. It is admired for its compact habit, its lustrous foliage, which insects rarely disfigure, its beautiful and abundant flowers, its handsome edible fruit, and its brilliant autumnal color. It readily adapts itself to cultivation, and is one of the best of the small trees of eastern America for the decoration of parks and gardens in all regions of extreme winter cold. It is easily raised from seeds which, like those of the other American species, do not germinate until the second year after they are planted.

The specific name, from *lentus*, first used by Cesalpini,[6] in allusion to its flexible branches, to designate the European *Viburnum Lantana*, was transferred to this species by Linnæus.

[1] Brunet, *Cat. Vég. Lig. Can.* 33. — Macoun, *Cat. Can. Pl.* i. 194.
[2] Bessey, *Bull. Exper. Stat. Nebraska*, iv. art. iv. 22.
[3] See ii. 86.
[4] *Hort. Kew.* i. 372. — Loudon, *Arb. Brit.* ii. 1033, f. 780.
[5] See i. 40.
[6] *De Plantis Libri* xvi. 76.

EXPLANATION OF THE PLATES.

Plate CCXXIII. Viburnum Lentago.

1. A flowering branch, natural size.
2. Diagram of a flower.
3. A flower, enlarged.
4. A flower, the corolla and stamens removed, enlarged.
5. A corolla displayed, enlarged.
6. Cross section of an ovary, enlarged.
7. Vertical section of a flower, the corolla and stamens removed, enlarged.
8. An ovule, much magnified.
9. An expanding bud, natural size.

Plate CCXXIV. Viburnum Lentago.

1. A fruiting branch, natural size.
2. Vertical section of a fruit, enlarged.
3. Cross section of a fruit, enlarged.
4. A stone, enlarged.
5. Side view of a stone, enlarged.
6. A seed, enlarged.
7. Vertical section of a seed, enlarged.
8. An embryo, much magnified.
9. A winter branchlet, natural size.

C. E. Faxon del. *Rapine sc.*

VIBURNUM LENTAGO, L.

A. Riocreux direx.t *Imp. R. Taneur, Paris.*

C.E.Faxon del. Toulet sc.

VIBURNUM LENTAGO, L.

A.Riocreux direx.t Imp. R.Taneur, Paris.

VIBURNUM PRUNIFOLIUM.

Black Haw. Stag Bush.

LEAVES ovate, oval, or suborbicular, their petioles usually naked. Winter-buds short-pointed or obtuse, coated with rufous pubescence.

Viburnum prunifolium, Linnæus, *Spec.* 268 (1753). — Miller, *Dict.* ed. 8, No. 2. — Marshall, *Arbust. Am.* 160. — Wangenheim, *Nordam. Holz.* 98. — Walter, *Fl. Car.* 116. — Willdenow, *Berl. Baumz.* 402; *Spec.* i. pt. ii. 1487; *Enum.* 326. — Abbot, *Insects of Georgia*, ii. 53. — Schkuhr, *Handb.* i. 233. — Michaux, *Fl. Bor.-Am.* i. 178. — *Nouveau Duhamel*, ii. 128, t. 38. — Persoon, *Syn.* i. 326. — Desfontaines, *Hist. Arb.* i. 344. — Poiret, *Lam. Dict.* viii. 653. — Du Mont de Courset, *Bot. Cult.* ed. 2, iv. 341. — Pursh, *Fl. Am. Sept.* i. 201. — Roemer & Schultes, *Syst.* vi. 631. — Hayne, *Dendr. Fl.* 37. — Elliott, *Sk.* i. 365. — Sprengel, *Syst.* i. 933. — Guimpel, Otto & Hayne, *Abbild. Holz.* 125, t. 101. — Watson, *Dendr. Brit.* i. 23, t. 23. — Audubon, *Birds*, t. 23. — De Candolle, *Prodr.* iv. 325. — Don, *Gen. Syst.* iii. 440. — Rafinesque, *Alsograph. Am.* 55. — Spach, *Hist. Vég.* viii. 312. — Hooker, *Fl. Bor.-Am.* i. 279. — Torrey & Gray, *Fl. N. Am.* ii. 14. — Walpers, *Rep.* ii. 451. — Darlington, *Fl. Cestr.* ed. 3, 115. — Örsted, *Videnskab. Medd. fra Nat. For. Kjobenh.* 1860, 301. — Chapman, *Fl.* 171. — Engelmann, *Trans. St. Louis Acad.* ii. 269. — Koch, *Dendr.* ii. 62. — Ridgway, *Proc. U. S. Nat. Mus.* 1882, 68. — Lauche, *Deutsche Dendr.* ed. 2, 207. — Sargent, *Forest Trees N. Am. 10th Census U. S.* ix. 94. — Gray, *Syn. Fl. N. Am.* i. pt. ii. 12. — Watson & Coulter, *Gray's Man.* ed. 6, 219.

Viburnum pyrifolium, Poiret, *Lam. Dict.* viii. 653 (1808). — Desfontaines, *Hist. Arb.* i. 345; *Cat. Hort. Paris*, ed. 3, 404. — Du Mont de Courset, *Bot. Cult.* ed. 2, iv. 341. — Pursh, *Fl. Am. Sept.* i. 201. — Nuttall, *Gen.* i. 202. — Roemer & Schultes, *Syst.* vi. 631. — Hayne, *Dendr. Fl.* 37. — Watson, *Dendr.* i. 22, t. 22. — De Candolle, *Prodr.* iv. 325. — Loudon, *Arb. Brit.* ii. 1034, f. 781, 782. — Rafinesque, *Alsograph. Am.* 55.

Viburnum amblodes, Rafinesque, *Alsograph. Am.* 55 (1838).

Viburnum prunifolium, var. **ferrugineum**, Torrey & Gray, *Fl. N. Am.* ii. 15 (1841).

A bushy tree, occasionally twenty to thirty feet in height, with a short and usually crooked trunk six to eight inches in diameter, and stout spreading rigid branches beset with slender spine-like branchlets; or at the north often reduced to a low much-branched shrub. The bark of the trunk varies from a quarter to a third of an inch in thickness and is broken into thick irregularly shaped plate-like red-brown scales. The branchlets, when they first appear, are bright red, and are glabrous or more or less covered with rufous pubescence; they soon turn green, and in their first winter are gray faintly or strongly tinged with red, covered with a slight bloom, and marked by orange-colored lenticels and by the large lunate leaf-scars which display three fibro-vascular bundle-scars; later they become dark brown tinged with red. The winter-buds are coated with dark rufous tomentum, and are covered with two scales; those which contain flower-bearing branches are ovate, gradually narrowed and obtuse at the apex, half an inch in length, and much larger than the axillary buds which are flattened by pressure against the stem; the bud-scales, which are accrescent, are soon after opening strap-shaped, purple, puberulous, and nearly an inch in length, and, often developing into leaf-like bodies with broad boat-shaped petioles, do not fall until after the flowers open. The leaves are ovate or rarely obovate, oval or suborbicular, rounded, acute or short-pointed at the apex, wedge-shaped or rounded at the base, and usually rather remotely or sometimes finely serrate with ridged incurved callous-tipped teeth; when they unfold they are tinged with red and are lustrous, glabrous on the lower surface, and covered on the upper side of the midribs and on the bright red petioles with scattered reddish hairs, or are clothed on the petioles, midribs, and lower surface of the primary veins with dense rusty brown tomentum; at maturity they are firm or sometimes subcoriaceous, dark green and glabrous on the upper surface, and on the lower pale and glabrous or covered with tufts of rusty tomentum chiefly along the narrow midribs and in the axils of the slender primary veins which are connected by reticulate veinlets; they

are one to three inches long, half an inch to three inches wide, and are borne on short grooved petioles which are one half to two thirds of an inch in length, often clothed throughout the season with rufous tomentum, and broad and boat-shaped on the first pair of leaves, and on vigorous shoots often narrowly wing-margined. In the autumn the leaves turn a brilliant scarlet or a dark vinous red before falling. The flowers, which open from the middle of March in Texas to the middle of May at the north, are produced in glabrous, glandular, or tomentose cymes two to four inches in diameter, and are borne on slender pedicels bibracteolate at the apex. The bracts and bractlets are subulate, a sixteenth of an inch long or less, usually red above the middle, and caducous. The calyx is narrowly ovate, with short rounded lobes often tipped with pink; the corolla is pure white and a quarter of an inch across when expanded, with oval or nearly orbicular lobes; the stamens are exserted, with slender filaments and pale yellow anthers, and the style is thick, conical, light green, and terminated by a broad stigma. The fruit is oval or slightly obovate, half an inch long, dark blue, and covered with a handsome glaucous bloom. It ripens in October, and is produced in few-fruited clusters with red stems marked by elevated lenticels. Hanging on the branches until the beginning of winter, it does not become sweet and edible until after it has been touched by frost.

Viburnum prunifolium is distributed from Fairfield County, Connecticut, and the valley of the lower Hudson River to Hernando County, Florida, the valley of the Guadaloupe River in Texas,[1] and to Missouri, Arkansas, and the Indian Territory. It is exceedingly common in the middle and southern states, especially in the neighborhood of the coast; at the north it is usually found in rich coppices on dry rocky hillsides, in fence-rows and by roadsides, and in the south in dry open Oak woods and on the margins of upland Pine forests.

The wood of *Viburnum prunifolium* is heavy, very hard, strong, brittle, and close-grained. It contains numerous obscure medullary rays, and is brown tinged with red, with thick nearly white sapwood composed of twenty to thirty layers of annual growth. The specific gravity of the absolutely dry wood is 0.8332, a cubic foot weighing 51.92 pounds.

The astringent bark is nervine, antispasmodic, tonic, and diuretic; it has been admitted into the American pharmacopœia, and is sometimes used in the form of decoctions or fluid extracts for the treatment of urinary affections and chronic diarrhœa and as a preventive of miscarriage,[2] although some medical writers believe that its value has been exaggerated.[3]

The earliest mention of *Viburnum prunifolium* appears in John Banister's Catalogue of American plants, published in Ray's *Historia Plantarum* in 1688;[4] according to Aiton, it was cultivated in England as early as 1731.[5]

Viburnum prunifolium varies considerably in the form of the leaves and in the amount and nature of their pubescent covering; at the north it is usually glabrous except in the early stages of growth; in the south the under surface of the leaves and their petioles are often clothed with rusty tomentum throughout the season. As an ornamental plant the Black Haw is valuable for its good habit, the abundance of its clusters of white flowers, its handsome fruit, and brilliant autumn foliage.

[1] Coulter, *Contrib. U. S. Nat. Herb.* ii. 156 (*Man. Pl. W. Texas*).

[2] Phares, *Atlanta Med. & Surg. Jour.* n. ser. vii. 408. — Abbot, *Bost. Med. & Surg. Jour.* xcix. 634. — Wilson, *Liverpool Med.-Chir. Jour.* v. 36. — *Brit. Med. Jour.* i. 987. — Rusby, *Bull. Pharm.* July, 1891, t. — *U. S. Dispens.* ed. 16, 1586.

[3] Johnson, *Man. Med. Bot. N. Am.* 164, t. 6.

[4] *Rhamnus Prunifolius fructu nigro, ossiculo compresso, The Black Haw*, ii. 1927.

Mespilus Prunifolia Virginiana non spinosa fructu nigricante, Plukenet, *Phyt.* 46, f. 2; *Alm. Bot.* 249. — Miller, *Dict.* No. 11.

Viburnum foliis subrotundis serratis glabris, Clayton, *Fl. Virgin.* 33.

[5] *Hort. Kew.* i. 371. — Loudon, *Arb. Brit.* ii. 1034, t. 193.

EXPLANATION OF THE PLATE.

PLATE CCXXV. VIBURNUM PRUNIFOLIUM.

1. A flowering branch, natural size.
2. A flower, enlarged.
3. A flower, the corolla and stamens removed, enlarged.
4. Vertical section of a flower, the corolla and stamens removed, enlarged.
5. A corolla, displayed.
6. A fruiting branch, natural size.
7. Cross section of a fruit, enlarged.
8. Vertical section of a fruit, enlarged.
9. A stone, enlarged.
10. An embryo, much magnified.
11. The end of a winter branchlet, natural size.

C.E. Faxon del. Rapine sc.

VIBURNUM PRUNIFOLIUM, L.

A. Riocreux direx.t Imp. R. Taneur, Paris.

EXOSTEMA.

FLOWERS perfect; calyx-limb 5-toothed; corolla gamopetalous, 5-lobed, quincuncially imbricated in æstivation; stamens 5; ovary 2-celled; ovules numerous, ascending. Fruit a 2-celled many-seeded crustaceous capsule. Leaves opposite, simple, stipulate, persistent.

Exostema, Richard, *Humboldt & Bonpland Pl. Æquin.* i. 131 (1808). — A. Richard, *Mém. Soc. Hist. Nat. Paris*, v. 200. — Meisner, *Gen.* 158. — Endlicher, *Gen.* 555. — Bentham & Hooker, *Gen.* ii. 42. — Baillon, *Hist. Pl.* vii. 491 (excl. *Badusa*). — Engler & Prantl, *Pflanzenfam.* iv. pt. iv. 53.

Solenandra, Hooker f. *Hooker Icon.* xii. t. 1150 (1876). — Bentham & Hooker, *Gen.* ii. 43.

Trees or shrubs, with usually terete branchlets, bitter bark, and watery juice. Leaves opposite, simple, sessile or petiolate, persistent; stipules interpetiolar, entire, denticulate or two-parted, deciduous. Flowers axillary, solitary or in many or few-flowered terminal panicles, large or small, fragrant, pedunculate, the peduncles bibracteolate above the middle. Calyx-tube ovoid, clavate, or turbinate, the limb short, five-lobed, its lobes nearly triangular, subulate or linear, persistent or deciduous. Corolla white, funnel-shaped, the tube long and narrow, erect, glabrous or pilose in the throat, the lobes of the limb linear, elongated, spreading. Stamens five, alternate with the lobes of the corolla, exserted; filaments filiform, united at the base into a short or long tube inserted on and adnate to the tube of the corolla; anthers oblong, linear, attached at the base, two-celled, the cells opening longitudinally. Disk epigynous, annular. Ovary inferior, two-celled; style simple, elongated, slender, exserted; stigma capitate, simple or minutely two-lobed; ovules numerous, attached on the two sides of a fleshy oblong peltate placenta fixed to the inner face of the cell, ascending, anatropous; raphe ventral; micropyle superior. Fruit capsular, many-seeded, cylindrical or clavate, two-celled, septicidally two-valved, the valves entire or two-parted; epicarp membranaceous, separable from the crustaceous endocarp. Seeds compressed, ovate or oblong, rounded or pointed at the apex, imbricated downwards on the placenta; testa membranaceous, chestnut-brown, lustrous, produced into a narrow wing. Embryo minute, in fleshy albumen; cotyledons flat; radicle terete, inferior.

Exostema is confined to the tropics of America, where about twenty species, chiefly found in the Antilles,[1] are distributed from southern Florida, where one species occurs, to Mexico, Central America,[2] and Brazil.[3]

The bark of Exostema contains active tonic properties. That of several species, especially of *Exostema Caribæum* and *Exostema floribundum*,[4] was considered a useful febrifuge[5] before the general introduction of the more valuable Cinchona barks, which now replace it except in domestic practice in the countries which Exostema inhabits.

The generic name, from ἔξω and στῆμα, relates to the long exserted stamens.

[1] A. Richard, *Fl. Cub.* iii. 5. — Grisebach, *Fl. Brit. W. Ind.* 323; *Cat. Pl. Cub.* 125.

[2] Őrsted, *Videnskab. Medd. fra Nat. For. Kjobenh.* 1852, 26. — Gray, *Proc. Am. Acad.* v. 180. — Hemsley, *Bot. Biol. Am. Cent.* ii. 13.

[3] Poeppig & Endlicher, *Nov. Gen. et Spec.* iii. 31, t. 231. — Schumann, *Martius Fl. Brasil.* vi. pt. vi. 192.

[4] Roemer & Schultes, *Syst.* v. 19 (1819). — Hayne, *Arzn.* vii. t. 45. — De Candolle, *Prodr.* iv. 360. — A. Richard, *l. c.* 6. — Grisebach, *l. c.*

Cinchona floribunda, Swartz, *Prodr.* 41 (1788); *Fl. Ind. Occ.* 375. — Lambert, *Cinchona*, 27, t. 7. — Poiret, *Lam. Dict.* vi. 37.

Cinchona montana, Badier, *Rozier Obs.* xxxiv. 129, t. 1 (1789). — Descourtilz, *Fl. Méd. Antill.* i. 57, t. 13.

Cinchona Luciana, Vitman, *Summa Pl.* Suppl. 264 (1802).

[5] Davidson, *Phil. Trans.* lxxiv. 452. — Fourcroy, *Ann. de Chim.* viii. 113. — Lunan, *Hort. Jam.* i. 391. — A. Richard, *Hist. Nat. Méd.* iii. 530. — Guibourt, *Hist. Drog.* ed. 7, iii. 186. — Rosenthal, *Syn. Pl. Diaphor.* 337.

EXOSTEMA CARIBÆUM.

Prince Wood.

FLOWERS on simple axillary peduncles. Leaves oblong-ovate to lanceolate, coriaceous.

Exostema Caribæum, Roemer & Schultes, *Syst.* v. 18 (1819). — Hayne, *Arzn.* vii. t. 44. — Sprengel, *Syst.* i. 705. — De Candolle, *Prodr.* iv. 359. — Don, *Gen. Syst.* iii. 481. — Dietrich, *Syn.* i. 722. — Spach, *Hist. Vég.* viii. 394. — Torrey & Gray, *Fl. N. Am.* ii. 36. — A. Richard, *Fl. Cub.* iii. 5. — Chapman, *Fl.* 180. — Grisebach, *Fl. Brit. W. Ind.* 324; *Cat. Pl. Cub.* 125. — Gray, *Syn. Fl. N. Am.* i. pt. ii. 23. — Sargent, *Forest Trees N. Am. 10th Census U. S.* ix. 95. — Hitchcock, *Rep. Missouri Bot. Gard.* iv. 92.

Cinchona Caribæa, Jacquin, *Enum. Pl. Carib.* 16 (1760); *Hist. Stirp. Am.* 61, t. 179, f. 95; *Obs. Bot.* ii. 27, t. 47; *Hist. Select. Stirp. Am.* 35, t. 64. — Linnæus, *Spec.* ed. 2, 245. — *Icon. Am. Gewäch.* i. 11, t. 33. — Swartz, *Obs.* 72. — Vahl, *Skriv. Nat. Selsk.* i. 21; *Symb.* ii. 37. — Gærtner, *Fruct.* i. 169, t. 33. — Willdenow, *Spec.* i. pt. ii. 959. — Gmelin, *Syst. Nat.* ii. 361. — Lambert, *Cinchona*, 38, t. 12 (excl. syn.). — Poiret, *Lam. Dict.* vi. 35; *Ill.* ii. 261, t. 164, f. 4. — Andrews, *Bot. Rep.* vii. t. 481. — Lunan, *Hort. Jam.* i. 391.

Cinchona Jamaicensis, Wright, *Phil. Trans.* lxvii. 504, t. 10 (1778).

A glabrous tree, in Florida sometimes twenty to twenty-five feet in height, with a trunk ten or twelve inches in diameter, slender erect branches which form a narrow head, and terete branchlets; or often a shrub only a few feet high. The bark of the trunk is an eighth of an inch thick and is divided by deep fissures into square smooth pale or nearly white plates. The branchlets, when they first appear, are dark green, but soon become dark red-brown and covered with pale lenticels, and in their second year are ashy gray and rather conspicuously marked by the elevated leaf-scars. The leaves are oblong-ovate to lanceolate, contracted into slender points and apiculate at the apex, wedge-shaped and gradually narrowed at the base into long slender orange-colored petioles, entire, thick and coriaceous, dark green on the upper surface and yellow-green on the lower, an inch and a half to three inches long and half an inch to an inch and a quarter broad, with prominent orange-colored midribs slightly impressed on the upper side and conspicuous reticulate veins; they appear in the autumn and in early spring and summer, and remain on the branches for one or two years. The stipules are a sixteenth of an inch long, nearly triangular and apiculate, with entire, dentate, or ciliate margins, and in falling mark the branchlets with ring-like scars. The flowers, which appear from March until June, are borne on one-flowered axillary peduncles and are exceedingly fragrant; they are three inches long, with an ovate calyx-tube, persistent nearly triangular calyx-lobes, a glabrous corolla, and filaments united at the base into a short tube. The fruit is cylindrical, two thirds of an inch long and dark brown, becoming black in drying. The seed is oblong and an eighth of an inch long, with a dark brown papillose coat and a light brown wing.

Exostema Caribæum is scattered over the keys of southern Florida and is common on Key West and Upper Metacombe Keys; it inhabits the West Indies, southern Mexico, and the west coast of Nicaragua.[1]

The wood of *Exostema Caribæum* is very heavy, exceedingly hard, strong, and close-grained, with a satiny surface susceptible of receiving a beautiful polish; it contains numerous obscure medullary rays, and is light brown handsomely streaked with different shades of yellow and brown, the bright yellow sapwood being composed of twelve to twenty layers of annual growth. The specific gravity of the absolutely dry wood is 0.9310, a cubic foot weighing 58.02 pounds.

Exostema Caribæum was first detected in Florida on Key West by Dr. J. L. Blodgett.

[1] Hemsley, *Bot. Biol. Am. Cent.* ii. 13.

EXPLANATION OF THE PLATE.

Plate CCXXVI. Exostema Caribæum.

1. A flowering branch, natural size.
2. Diagram of a flower.
3. A flower, the corolla removed, enlarged.
4. A corolla with stamens, displayed, enlarged.
5. Vertical section of an ovary, enlarged.
6. An anther, enlarged.
7. An ovule, much magnified.
8. A fruiting branch, natural size.
9. Vertical section of a fruit cut parallel with the dissepiment, enlarged.
10. Vertical section of a fruit cut at right angles with the dissepiment, enlarged.
11. Cross section of a fruit, enlarged.
12. Vertical section of a seed, enlarged.
13. An embryo, much magnified.
14. A portion of a young branch showing stipule, enlarged.

C.E. Faxon del. *Toulet sc.*

EXOSTEMA CARIBÆUM, R.+ S.

A. Riocreux direx.t *Imp. R. Taneur, Paris.*

PINCKNEYA.

Flowers perfect; calyx-limb 5-lobed, the lobes unequal, sometimes developed into colored petaloid leaf-like bodies; corolla gamopetalous, 5-lobed, the lobes valvate in æstivation; stamens, 5; ovary inferior, 2-celled; ovules numerous, horizontal. Fruit a many-seeded 2-celled capsule. Leaves opposite, entire, petiolate, stipulate, deciduous.

Pinckneya, Michaux, *Fl. Bor.-Am.* i. 103 (1803). — Endlicher, *Gen.* 554. — Meisner, *Gen.* 158. — Bentham & Hooker, *Gen.* ii. 47. — Baillon, *Hist. Pl.* vii. 472 (excl. *Pogonopus*).

A small tree, with fibrous roots, scaly light brown bitter bark, resinous buds, stout terete pithy branchlets coated while young with hoary tomentum, ultimately glabrous and marked with scattered minute white lenticels and large nearly orbicular or obcordate leaf-scars displaying a lunate row of numerous crowded fibro-vascular bundle-scars. Terminal buds ovate, terete, contracted above the middle into slender points, covered with the dark red-brown lanceolate-acute stipules of the last pair of leaves of the previous year often persistent on the base of the growing shoots and marked at the base with two broadly ovate pale scar-like slightly pilose elevations; axillary buds obtuse, minute, and nearly immersed in the bark. Leaves opposite, complanate in vernation, oblong-oval or ovate, acute at the apex, wedge-shaped at the base, and gradually narrowed into long stout petioles, entire, membranaceous, coated at first with pale pubescence, at maturity dark green and puberulous on the upper surface, paler and puberulous on the lower surface, especially along the stout midribs and primary veins, deciduous; stipules interpetiolar, conspicuously glandular-punctate at the base on the inner face, inclosing the leaf in the bud, triangular, subulate, pink, becoming oblong, acute, scarious, light brown, caducous. Flowers in pedunculate terminal and axillary pubescent trichotomous few-flowered cymes. Bracts and bractlets linear-lanceolate, acute, at first pink, becoming scarious, deciduous, or the bracts sometimes enlarged, and rose-colored. Flower-buds sulcate, coated with thick pale tomentum. Calyx-tube clavate, bracteolate at the base, covered with hoary tomentum, not closed in the bud; calyx-limb five-lobed, the lobes deciduous, subulate-lanceolate, green tinged with pink, scarious, or in the central flower of the ultimate division of the cyme with one or rarely with two produced into oval or ovate acute petaloid rose-colored puberulous membranaceous leaf-like bodies. Corolla salver-formed, light yellow, cinereo-tomentose, with a long narrow tube somewhat enlarged in the throat, five-lobed, the lobes oblong-obtuse, marked with red lines and pilose with long white hairs on the inner surface, recurved after anthesis. Stamens five, exserted; filaments filiform, free, inserted opposite the lobes of the calyx on the tube of the corolla below the middle; anthers oblong, emarginate, attached on the back below the middle, introrse, two-celled, the cells opening longitudinally. Disk epigynous, fleshy, annular, depressed in the centre. Ovary two-celled; style filiform, exserted, slightly enlarged, two-lobed and stigmatic at the apex; ovules numerous, inserted in two ranks on a thin two-lipped placenta longitudinally adnate to the inner face of the cell, anatropous; raphe ventral; micropyle superior. Fruit a subglobose obscurely two-lobed two-celled many-seeded capsule, loculicidally two-valved, the valves thin and papery, light brown, puberulous especially at the base, faintly rayed and marked with oblong pale spots and with the scars left by the falling of the deciduous calyx-limb and style, sometimes tardily septicidally two-parted to the middle, persistent on the branches during winter, the valves finally falling from the woody axis; epicarp very thin, brittle, separable from the slightly thicker tough woody endocarp. Seeds horizontal, two ranked, minute, compressed; testa thin, light brown, reticulate-veined, produced into a broad thin

lunate-orbicular wing. Embryo elongated, immersed in the thick fleshy albumen; cotyledons ovate-oblong, foliaceous, larger than the terete erect radicle turned towards the hilum.

The wood of Pinckneya is close-grained, although soft and weak, and contains obscure remote medullary rays and bands of four to six rows of large open ducts marking the layers of annual growth; it is brown, with lighter colored sapwood composed of eight or ten layers of annual growth. The specific gravity of the absolutely dry wood is 0.5350, a cubic foot weighing 33.34 pounds. The bark has been used successfully in the treatment of intermittent fevers.[1]

It is supposed that Pinckneya was discovered by John Bartram,[2] as specimens of this tree are said to have been found in the herbarium of the younger Linnæus;[3] the earliest printed account of it appears in the *Travels*[4] of his son, William Bartram, published in 1791. It was first brought into general notice, however, by the French botanist Michaux, who found it on the banks of the St. Mary's River in Florida or Georgia in 1791.[5]

The generic name commemorates the scientific accomplishments of Charles Cotesworth Pinckney of South Carolina, the Revolutionary patriot and general, who, after the liberty of the United States had been established, devoted himself to the study of botany and chemistry. The genus is represented by a single species.

[1] Rafinesque, *Med. Fl.* ii. 57, t. 72. — Lindley, *Fl. Med.* 433. — Griffith, *Med. Bot.* 365, f. 174. — Porcher, *Resources of Southern Fields and Forests*, 404. — Naudain, *Am. Jour. Pharm.* April, 1885. — *U. S. Dispens.* ed. 16, 1894.

[2] See i. 8.

[3] W. P. C. Barton, *Fl. N. Am.* i. 27.

[4] 16, 468.

[5] Michaux f. *Hist. Arb. Am.* ii. 276.

PINCKNEYA PUBENS.

Georgia Bark.

Pinckneya pubens, Michaux, *Fl. Bor.-Am.* i. 105, t. 13 (1803). — Du Mont de Courset, *Bot. Cult.* ed. 2, iv. 311. — Willdenow, *Enum.* Suppl. 10. — Michaux f. *Hist. Arb. Am.* ii. 276, t. 24. — Pursh, *Fl. Am. Sept.* i. 158. — Nuttall, *Gen.* i. 137. — W. P. C. Barton, *Fl. N. Am.* i. 25, t. 7. — Sprengel, *Syst.* i. 705. — Elliott, *Sk.* i. 269. — De Candolle, *Prodr.* iv. 366. — Audubon, *Birds*, t. 165. — Don, *Gen. Syst.* iii. 486. — D. Don, *Trans. Linn. Soc.* xvii. 143. — Spach, *Hist. Vég.* viii. 400. — Torrey & Gray, *Fl. N. Am.* ii. 37. — Chapman, *Fl.* 179. — *Fl. des Serres*, xix. 13, t. 772. — Gray, *Syn. Fl. N. Am.* i. pt. ii. 23. — Sargent, *Forest Trees N. Am. 10th Census U. S.* ix. 95. — Engler & Prantl, *Pflanzenfam.* iv. pt. iv. 21, f. 6, M–O.

Cinchona Caroliniana, Poiret, *Lam. Dict.* vi. 40 (1804).

Pinckneya pubescens, Lamarck, *Ill.* ii. 265 (—?). — Persoon, *Syn.* i. 197. — Gærtner f. *Fruct.* iii. 81, t. 194, f. 3.

Pinckneya pubens is a tree twenty to thirty feet in height, with a trunk occasionally eight or ten inches in diameter, and slender spreading branches which usually form a narrow round-topped head. The bark of the trunk is a quarter of an inch thick, with a light brown surface divided into minute appressed scales. The branchlets, when they first appear, are coated with hoary white tomentum; they soon turn light red-brown, and are pubescent during the summer and slightly puberulous during the first winter, but ultimately become glabrous. The leaves, which unfold in March, are five to eight inches long and three to four inches broad when fully grown, and are borne on petioles two thirds of an inch to an inch and a half in length. The flowers appear late in May and in the early days of June, and are produced in open clusters seven or eight inches across; they are an inch and a half long, their petaloid calyx-lobes being sometimes two inches and a half in length and half an inch in breadth. The fruit ripens in the autumn and is an inch long and two thirds of an inch broad.

Pinckneya pubens is one of the rarest trees of eastern North America; it inhabits low wet sandy swamps on the borders of streams and is distributed from the coast region of South Carolina to the basin of the upper Appalachicola River and its tributaries in Florida and Georgia.

The Georgia Bark, when in flower, is one of the most beautiful of North American trees. It was planted by Michaux in the experimental garden which he established near Charleston, and was sent by him to the French horticulturist Cels,[1] who probably first cultivated[2] it in Europe, although, according to Aiton,[3] it was introduced into English gardens by John Fraser as early as 1786. It is occasionally found in old gardens in South Carolina and Georgia, but is rarely cultivated, and has never received from gardeners the attention which the beauty and peculiar structure of its flowers would justify.

[1] See ii. 4.

[2] Cuvier, *Recueil des Éloges Historiques*, i. 252.

[3] *Hort. Kew.* ed. 2. i. 372.

EXPLANATION OF THE PLATES.

Plate CCXXVII. Pinckneya pubens.

1. A flowering branch, natural size.
2. Diagram of a flower.
3. Vertical section of a flower, natural size.
4. Vertical section of a flower with petaloid calyx-lobe, the corolla removed, enlarged.
5. Front and rear views of a stamen, enlarged.
6. Cross section of an ovary, enlarged.
7. An ovule, much magnified.
8. Portion of a young branchlet showing stipule, natural size.

Plate CCXXVIII. Pinckneya pubens.

1. A fruiting branch, natural size.
2. Cross section of a fruit, natural size.
3. A seed, natural size.
4. Vertical section of a seed, enlarged.
5. An embryo, much magnified.
6. A winter branchlet, natural size.

C.E.Faxon del. Toulet sc.

PINCKNEYA PUBENS, Michx.

A.Riocreux direx.t Imp. R Taneur, Paris.

C.E.Faxon direx.t

Lövendal sc.

PINCKNEYA PUBENS, Michx.

A.Riocreux direx.t

Imp. R.Taneur, Paris.

GUETTARDA.

FLOWERS perfect or polygamo-diœcious; calyx produced into an elongated tube; corolla gamopetalous, 4 to 9-lobed, the lobes quincuncially imbricated in æstivation; stamens 4 to 9; ovary inferior, 4 to 9-celled; ovules solitary, suspended. Fruit a fleshy 1-stoned 4 to 9-seeded drupe. Leaves opposite or rarely verticillate, membranaceous, or coriaceous, stipulate.

Guettarda, Ventenat, *Choix*, 1 (1803). — A. Richard, *Mém. Soc. Hist. Nat. Paris*, v. 121. — Meisner, *Gen.* 165. — Endlicher, *Gen.* 540 (excl. sec. *Laugeria*). — Bentham & Hooker, *Gen.* ii. 99. — Baillon, *Hist. Pl.* vii. 423 (excl. *Timonius*, *Chomelia*, *Malanea*, *Hodgkinsonia*, *Antirrhœa*, *Bobea*, and *Obbea*). — Engler & Prantl, *Pflanzenfam.* iv. pt. iv. 97.

Matthiola, Linnæus, *Gen.* 49 (1737). — Adanson, *Fam. Pl.* ii. 159. — A. L. de Jussieu, *Gen.* 206.

Guettarda, Linnæus, *Syst.* ed. 10, 1270 (1759); *Gen.* ed. 6, 492. — Adanson, *Fam. Pl.* ii. 147. — A. L. de Jussieu, *Gen.* 207.

Halesia, Browne, *Nat. Hist. Jam.* 205 (1756).

Laugieria, Jacquin, *Hist. Stirp. Am.* 64 (1763). — Linnæus, *Gen.* ed. 6, 102 (*Laugeria*).

Cadamba, Sonnerat, *Voy. Ind.* ii. 228 (1782).

Donkelaaria, Lemaire, *Ill. Hort.* ii. Misc. 72 (1855).

Small trees or shrubs, with bitter bark. Leaves opposite, rarely in verticils of three, subsessile or petiolate, membranaceous or coriaceous. Stipules interpetiolar, deciduous. Flowers sessile, large or small, bracteolate or ebracteolate, secund on the branches of axillary forked pedunculate cymes, often dichotomously branched with a flower between the contracted branches, or rarely one-flowered. Bracts and bractlets lanceolate, acute, minute, deciduous. Calyx ovoid or globose, the limb produced above the ovary into a cup-shaped or elongated tube, irregularly two to four or regularly four to nine-toothed, deciduous or persistent. Corolla salver-shaped, with an elongated cylindrical erect or curved tube naked in the throat, the limb four to nine-lobed, with oblong acute or rounded lobes. Stamens four to nine, inserted in the tube of the corolla, alternate with its lobes, included; filaments short or wanting; anthers oblong-linear, attached on the back, introrse, two-celled, the cells opening longitudinally. Disk epigynous. Ovary four to nine-celled, the cells elongated, tubular; style stout or filiform; stigma subcapitate or minutely two-lobed; ovules solitary, suspended on the thickened funicle from the inner angle of the cell, anatropous; raphe ventral; micropyle superior. Drupe globose or obtusely angled, or rarely ovoid; sarcocarp thin and fleshy; putamen osseous or ligneous, globose, obtusely angled or sulcate, four to nine-celled, the cells narrow and often curved upward. Seed compressed, suspended on the thick funicle closing the orifice of the wall of the stone, straight or excurved; testa membranaceous; albumen fleshy, thin or wanting. Embryo elongated, cylindrical or compressed; cotyledons flat, minute, not longer than the elongated terete radicle turned towards the hilum.

Guettarda is represented by about fifty species, mostly confined to the tropical regions of America,[1] where they are found from southern Florida to Mexico, Central America,[2] Brazil,[3] and Peru,[4] although one species[5] is widely distributed on the maritime shores from eastern tropical Africa to Australia and

[1] De Candolle, *Prodr.* iv. 455 (excl. sec. *Laugeria*). — Walpers, *Rep.* ii. 486; vi. 49; *Ann.* ii. 764. — Grisebach, *Fl. Brit. W. Ind.* 331; *Cat. Pl. Cub.* 130.

[2] Hemsley, *Bot. Biol. Am. Cent.* ii. 41. — Donnell Smith, *Bot. Gazette*, xviii. 204.

[3] Chamisso & Schlechtendal, *Linnæa*, iv. 181. — J. Müller, *Martius Fl. Brasil.* vi. pt. v. 14.

[4] Ruiz & Pavon, *Fl. Peruv.* ii. 22 (*Laugieria*). — Humboldt, Bonpland & Kunth, *Nov. Gen. et Spec.* iii. 420. — Kunth, *Syn. Pl. Æquin.* iii. 55.

[5] *Guettarda hirsuta.*

Nyctanthes hirsuta, Linnæus, *Spec.* 6 (1753).

Guettarda speciosa, Linnæus, *Spec.* 991 (1753). — Blume, *Bijdr. Fl. Ned. Ind.* 993. — De Candolle, *l. c.* — *Bot. Reg.* xvii. t. 1393. —

the islands of the Pacific Ocean. Two species are found within the territory of the United States; one of these is a small tree, and the other a shrub[1] which also inhabits the West Indies and Mexico.

Guettarda has few useful properties. The bark of some of the American species is occasionally employed as a tonic and febrifuge, and the powdered bark of the Old World species has been found valuable in the treatment of ulcers and wounds.[2] A few of the species are cultivated for ornament, particularly *Guettarda hirsuta*, which is often planted in tropical gardens on account of the delightful fragrance of its pure white flowers.

The genus was named for Jean Étienne Guettard,[3] a distinguished French botanist and mineralogist.

Miquel, *Fl. Ind. Bat.* ii. 262. — Bentham, *Fl. Austral.* iii. 419. — Oliver, *Fl. Trop. Afr.* iii. 125. — Kurz, *Forest Fl. Brit. Burm.* ii. 37. — Hooker f. *Fl. Brit. Ind.* iii. 126.

Cadamba jasminiflora, Sonnerat, *Voy. Ind.* ii. 228, t. 128 (1782).

Jasminum hirsutum, Willdenow, *Spec.* i. 36 (1797).

Laugieria hirsuta, Ruiz & Pavon, *Fl. Peruv.* ii. 22, t. 145 (1799).

[1] *Guettarda scabra*, Ventenat, *Choix*, 1, t. 1 (1803). — Lamarck, *Ill.* ii. 218, t. 154, f. 3. — De Candolle, *Prodr.* iv. 456. — Grisebach, *Fl. Brit. W. Ind.* 332; *Cat. Pl. Cub.* 131. — Hemsley, *Bot. Biol Am. Cent.* ii. 42. — Gray, *Syn. Fl. N. Am.* i. pt. ii. 30. — Eggers, *Bull. U. S. Nat. Mus.* No. 13, 60 (*Fl. St. Croix and the Virgin Islands*). — Hitchcock, *Rep. Missouri Bot. Gard.* iv. 93.

Matthiola scabra, Linnæus, *Spec.* 1192 (1753).

Guettarda rugosa, Swartz, *Prodr.* 59 (1788); *Fl. Ind. Occ.* i. 632. — De Candolle, *l. c.* (teste Grisebach, *Fl. Brit. W. Ind. l. c.*).

Guettarda Havanensis, De Candolle, *l. c.* 455 (1830). — A. Richard, *Fl. Cub.* iii. 19.

Guettarda ambigua, A. Richard, *l. c.* 20 (not De Candolle) (1853). — Chapman, *Fl.* 178 (1865).

[2] Rosenthal, *Syn. Pl. Diaphor.* 332.

[3] Jean Étienne Guettard (1715–1786) was born at Étampes, and at an early age became distinguished for his observations on the habits of plants, which obtained his admission into the Académie des Sciences in 1743 and made him known to Linnæus. Later he abandoned botany and devoted himself entirely to mineralogy, which he studied in many European countries. Guettard was one of the first naturalists to appreciate the value of mineralogical maps, of which he constructed several. He is the author of *Observations sur les Plantes*, published in two volumes in 1747, of five volumes of *Mémoires sur differentes parties des Sciences et Arts*, and of many papers published in the Memoirs of the French Academy.

GUETTARDA ELLIPTICA.

FLOWERS perfect, 4-parted, in forked few-flowered cymes; calyx tubular; corolla sericeo-canescent on the outer surface. Fruit globose, 4 to 8-celled. Leaves membranaceous.

Guettarda elliptica, Swartz, *Prodr.* 59 (1788); *Fl. Ind. Occ.* i. 634. — Lamarck, *Ill.* ii. 218. — Persoon, *Syn.* i. 200. — Poiret, *Lam. Dict.* Suppl. ii. 859. — Lunan, *Hort. Jam.* ii. 66. — Roemer & Schultes, *Syst.* iv. 442. — De Candolle, *Prodr.* iv. 457. — Dietrich, *Syn.* i. 787. — Don, *Gen. Syst.* iii. 551. — Torrey & Gray, *Fl. N. Am.* ii. 35. — Grisebach, *Fl. Brit. W. Ind.* 332; *Cat. Pl. Cub.* 131. — Gray, *Syn. Fl. N. Am.* i. pt. ii. 30. — Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix. 96. — Hitchcock, *Rep. Missouri Bot. Gard.* iv. 93.

Guettarda Blodgettii, Chapman, *Fl.* 178 (1865).

A tree, occasionally in Florida eighteen or twenty feet in height, with an irregularly buttressed or lobed trunk five or six inches in diameter, the deep depressions between the lobes continuous or often interrupted, slender upright branches, and thin terete branchlets. The bark of the trunk is a sixteenth of an inch thick, with a smooth dark brown surface covered with large irregularly shaped pale blotches and numerous small white spots. The branchlets, when they first appear, are coated with long pale or rufous hairs, and in their second year are light red-brown or ashy gray and conspicuously marked by pale lenticels and large elevated nearly orbicular leaf-scars. The leaves are opposite, broadly oval to elliptical-oblong, acute or obtuse and apiculate at the apex, wedge-shaped and rounded at the base, and entire; when they unfold they are covered with silky hairs, and at maturity are three quarters of an inch to two and a half inches in length, half an inch to an inch in breadth, membranaceous, dark green and pilose or glabrate on the upper surface, lighter and pubescent on the lower, especially along the stout midribs and in the axils of the four to six pairs of primary veins; they are borne on stout hairy petioles from a quarter to half an inch long, and unfold in Florida in May and June, remaining on the branches until the trees begin their growth the following year. The flowers, which in Florida appear in June, are yellowish white and a quarter of an inch in length, and are produced in slender hairy-stemmed cymes developed near the ends of the branches from the axils of leaves of the year or from bud-scales at the base of the new shoots. The peduncles, which are shorter than the leaves, are forked near the apex and produce a flower in the fork and three at the end of each branch, or the lateral flowers of these clusters are replaced by branches which at their apex produce three flowers. The bractlets, which subtend the branches of the peduncle and the lateral flowers of the ultimate divisions of the inflorescence, are linear-lanceolate, acute, coated with hairs, one sixteenth of an inch long, and deciduous. The calyx is nearly globose and is contracted into an elongated tube, four-lobed at the apex with nearly triangular acute lobes; it is coated on the outer surface with long pale hairs and is half the length of the salver-shaped erect corolla, which is externally canescent and four-lobed, with rounded lobes. The oblong anthers are borne on short slender filaments inserted above the middle of the tube of the corolla. The fruit, which ripens in November, is globose, dark purple, pilose, a third of an inch in diameter, and crowned with the remnants of the persistent calyx-tube; the flesh is thin, sweet, and mealy. The stone is globose, obscurely ridged, four to eight-celled, and usually two to four-seeded. The seed is oblong-lanceolate, compressed, nearly straight, and covered with a thin pale coat.

Guettarda elliptica is found in Florida on the southern keys, growing in the immediate neighborhood of the coast; it also inhabits the Bahama Islands and the coast of Jamaica, where it was discovered by the Swedish botanist Swartz late in the last century.

The wood of *Guettarda elliptica* is heavy, hard, very close-grained, with a satiny surface susceptible of receiving a beautiful polish; it contains many thin medullary rays and numerous small scattered open ducts, and is light brown tinged with red, with thin sapwood composed of six to ten layers of annual growth. The specific gravity of the absolutely dry wood is 0.8337, a cubic foot weighing 51.96 pounds.[1]

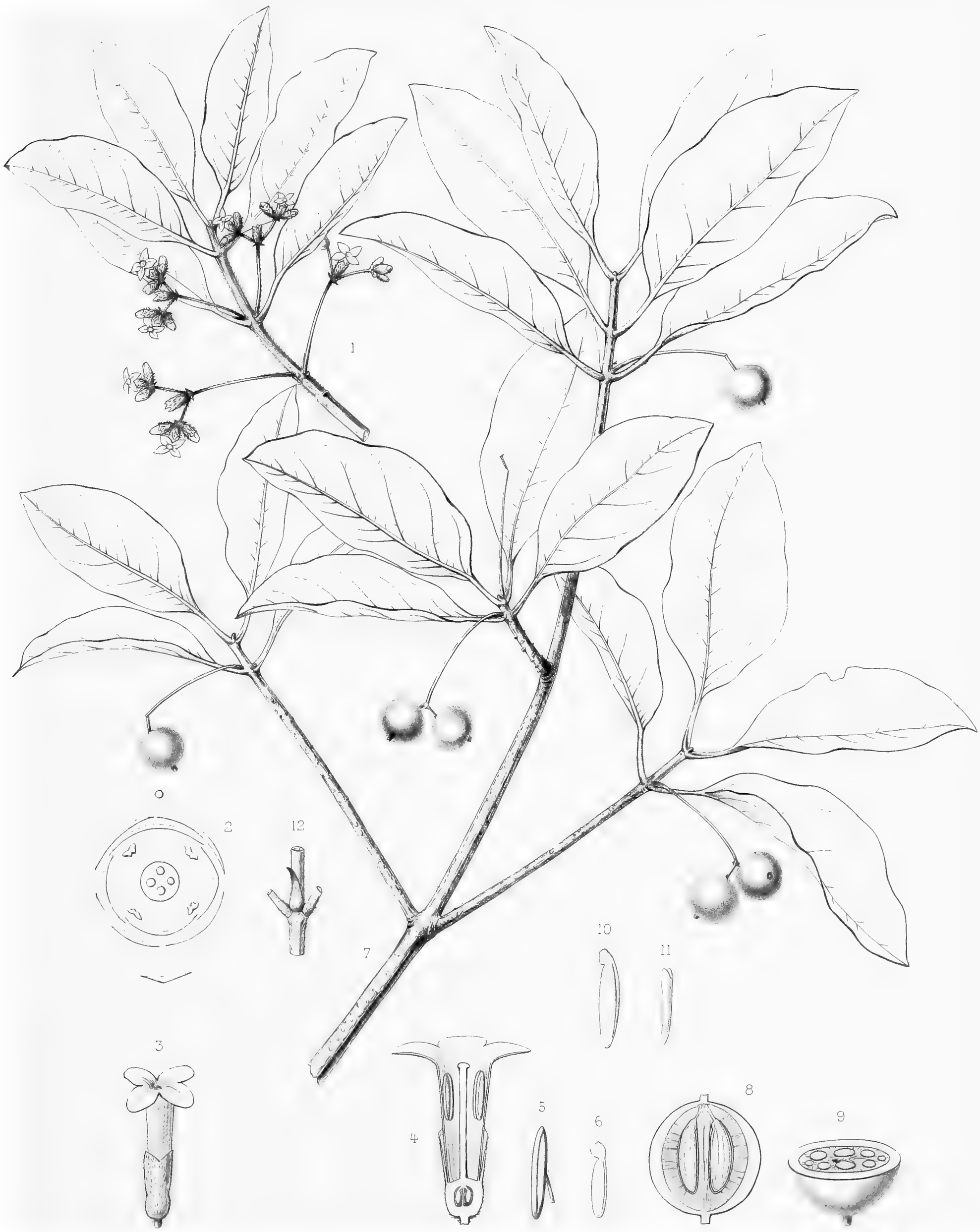
Guettarda elliptica was discovered in Florida by Dr. J. L. Blodgett on Key West.

[1] In Florida *Guettarda elliptica* grows slowly. The specimen collected on Key West for the Jesup Collection of North American Woods in the American Museum of Natural History in New York is six inches in diameter and shows sixty-six layers of annual growth.

EXPLANATION OF THE PLATE.

PLATE CCXXIX. GUETTARDA ELLIPTICA.

1. A flowering branch, natural size.
2. Diagram of a flower.
3. A flower, enlarged.
4. Vertical section of a flower, enlarged.
5. A stamen, enlarged.
6. An ovule, much magnified.
7. A fruiting branch, natural size.
8. Vertical section of a fruit, enlarged.
9. Cross section of a fruit, enlarged.
10. A seed, enlarged.
11. An embryo, much magnified.
12. Portion of a young branch showing stipule, enlarged.



C.E. Faxon del. *Himely sc.*

GUETTARDA ELLIPTICA, Sw.

A. Riocreux direx.t *Imp. R. Taneur, Paris.*

VACCINIUM.

FLOWERS perfect; calyx-tube adnate to the ovary, the limb 4 or 5-lobed; corolla gamopetalous, epigynous, 4 or 5-toothed, the teeth imbricated in æstivation; stamens 8 or 10; ovary inferior, 4 or 5 or imperfectly 8 to 10-celled; ovules numerous, attached to a central placenta. Fruit a many-seeded berry. Leaves alternate, membranaceous or coriaceous, destitute of stipules.

Vaccinium, Linnæus, *Gen.* 110 (1737). — Adanson, *Fam. Pl.* ii. 164. — A. L. de Jussieu, *Gen.* 162. — Endlicher, *Gen.* 757. — Meisner, *Gen.* 243. — Bentham & Hooker, *Gen.* ii. 573. — Baillon, *Hist. Pl.* xi. 182.

Oxycoccus, Adanson, *Fam. Pl.* ii. 164 (1763). — Endlicher, *Gen.* 757. — Bentham & Hooker, *Gen.* ii. 575. — Baillon, *Hist. Pl.* xi. 183.

Schollera, Roth, *Tent. Fl. Germ.* i. 170 (1788).

Vitis-Idæa, Moench, *Meth.* 47 (1794).

Cavinium, Petit-Thouars, *Roemer Coll. Bot.* 204 (1809).

(?) **Adnaria**, Rafinesque, *Fl. Ludovic.* 56 (1817).

Batodendron, Nuttall, *Trans. Am. Phil. Soc.* n. ser. viii. 261 (1843).

Picrococcus, Nuttall, *Trans. Am. Phil. Soc.* n. ser. viii. 262 (1843).

Metagonia, Nuttall, *Trans. Am. Phil. Soc.* n. ser. viii. 263 (1843).

Epigynium, Klotzsch, *Linnæa*, xxiv. 49 (1851).

Shrubs, sometimes epiphytal, or rarely small trees, with scaly buds and fibrous roots. Leaves simple, alternate, entire or dentate, membranaceous or coriaceous, deciduous or often persistent. Flowers small, bibracteolate, in many-bracted axillary racemes or in terminal or axillary fascicles, or solitary. Bracts small or rarely foliaceous. Calyx-tube terete, globose, hemispherical or turbinate, the limb short, four or five-lobed, the lobes equal or rarely unequal, persistent. Corolla white, rose-colored, or red, urceolate, campanulate, or occasionally tubular or conical, terete, or rarely costate or angled, the limb four or five-lobed or toothed, the teeth short, or rarely elongated and revolute. Stamens ten or sometimes eight, epigynous or inserted on the very base of the corolla; filaments filiform, free, short or elongated, usually hirsute; anthers attached and awned or muticous on the back, introrse, two-celled, the cells produced upwards into erect, rarely curved, tubes dehiscent by terminal transverse or oblique, rotund, or elongated pores, or rarely by elongated clefts; pollen-grains compound, of four united grains. Disk pulvinate or convex, rarely flat, glabrous or pilose, occasionally lobed or angled. Ovary four or five-celled, the cells sometimes imperfectly divided by the development from the back of a false partition;[1] style filiform, erect; stigma minute, simple or capitate; ovules few or many in each cell, attached to the interior angle by a two-lipped placenta, anatropous; raphe ventral; the micropyle superior. Fruit a dry or juicy globose berry crowned with the calyx-limb, four or five, or imperfectly eight or ten-celled, the cells few or many-seeded. Seed small or minute, compressed, ovoid or reniform; testa crustaceous. Embryo clavate, minute, surrounded by fleshy albumen, axile, erect; cotyledons ovate, radicle terete, turned towards the hilum.[2]

[1] Gray, *Mem. Am. Acad.* n. ser. iii. 52 (*Chlor. Bor.-Am.*).

[2] The genus has been divided into the following sections: —

BATODENDRON. Flowers in leafy bracted racemes; corolla open-campanulate, 5-lobed; anthers awned on the back, tipped with slender tubes; ovary incompletely 10-celled. Leaves deciduous. Eastern North America.

CYANOCOCCUS. Flowers in fascicles or short racemes, appearing with the leaves; corolla cylindrical to ovoid or oblong-campanulate, 5-lobed; anthers awned; ovary completely or incompletely 10-celled. Eastern North America.

EUVACCINIUM. Flowers solitary or 2 to 4 together on drooping pedicels, appearing with the leaves; corolla urceolate or subcylindrical, 4 to 5-lobed; anthers awned on the back; ovary 4 or

Vaccinium, with about one hundred species, is distributed through the boreal and temperate regions of the northern hemisphere, and occurs within the tropics at high elevations above the sea north and south of the equator. In North America twenty-five species and several varieties are distinguished;[1] one is a small tree, while the others are tall or small shrubs.

The fruits of many of the species are edible. The most valuable are the cranberries, the red acid berries of the North American *Vaccinium macrocarpon*,[2] which are now consumed in enormous quantities in the form of a conserve, and of *Vaccinium Oxycoccos*,[3] which are used in the same manner in all northern countries. In the eastern United States blueberries, the sweet blue fruits of several species of the section Cyanococcus, are eaten in large quantities raw or cooked and are often dried or preserved. The small dark red acid fruits of *Vaccinium Vitis-Idæa*,[4] an inhabitant of the Arctic Circle and of elevated northern regions round the world, are cooked and eaten in the northern countries of Europe, in Siberia, Japan, and North America. Bilberries, the blue-black sweet fruits of *Vaccinium uliginosum*[5] and of *Vaccinium Myrtillus*,[6] are eaten raw and cooked in northern Europe and in some parts of North America; and in California the sweetish fruits of *Vaccinium occidentale*[7] are gathered on the Sierra Nevada Mountains in large quantities. Citric acid[8] is obtained from the fruit of

5-celled. North America, Europe, Asia Minor, Madeira, and the Canary Islands.

VITIS-IDÆA. Flowers in short racemes on clusters from separate buds; corolla ovate or globose-urceolate, 4 to 5-lobed; anthers awned; ovary 4 to 5-celled. Leaves coriaceous, persistent. North America, West Indies, western South America, and Europe.

NEURODESIA. Flowers in short terminal or subterminal racemes; corolla urceolate-campanulate or urceolate, 5-lobed; anthers awned on the back; ovary 5-celled. Leaves coriaceous, persistent, subimbricated. Western South America and Guiana.

DISTERIGMA. Flowers axillary, solitary or two or three together; corolla urceolate or tubular-campanulate, 4 to 5-lobed; anthers awned on the back; ovary 4 to 5-celled. Leaves minute, coriaceous, usually entire. Western South America.

MACROPELMA. Flowers axillary, solitary; corolla cylindrical-urceolate, 5-lobed; anthers awned on the back; ovary 5-celled. Leaves serrate, coriaceous, persistent. Islands of the Pacific Ocean.

CINCTOSANDRA. Flowers in terminal and axillary racemes; corolla campanulate, deeply 5-lobed; anthers awned on the back; ovary 5-celled. Leaves serrate, coriaceous, persistent. Madagascar and eastern tropical Africa.

EPIGYNIUM. Flowers in corymbs or racemes, rarely solitary; corolla urceolate or conical; stamens inclosed; filaments pilose; ovary 5 or incompletely 10-celled. Leaves coriaceous, persistent. India, Malay Archipelago, China, and Japan.

LEPTOTHAMNIA. Flowers in axillary many-flowered racemes; corolla conico-urceolate, 5-toothed; anthers awned on the back; ovary 5-celled. Leaves acuminate, long-pointed. Western South America and the West Indies.

OXYCOCCUS. Flowers axillary and terminal on long slender pedicels; corolla deeply 5-parted, the lobes reflexed; anthers awnless, exserted; ovary 4-celled. Leaves small, entire, persistent. North America, Europe, and northern Asia.

[1] Gray, *Syn. Fl. N. Am.* ii. 20.

[2] Aiton, *Hort. Kew.* ii. 13, t. 7 (1789). — Willdenow, *Spec.* ii. 355. — *Bot. Mag.* lii. t. 2586. — Gray, *l. c.* 26. — Watson & Coulter, *Gray's Man.* ed. 6, 314.

Vaccinium hispidulum, Wangenheim, *Nordam. Holz.* 108, t. 30, f. 67 (not Linnæus) (1787).

Vaccinium Oxycoccus, var. *oblongifolium*, Michaux, *Fl. Bor.-Am.* i. 228 (1803).

Oxycoccus palustris, var. (?) *macrocarpus*, Persoon, *Syn.* i. 419 (1805).

Oxycoccus macrocarpus, Pursh, *Fl. Am. Sept.* i. 263 (1814). — W. P. C. Barton, *Fl. N. Am.* i. 58, t. 17. — De Candolle, *Prodr.* vii. 577. — Emerson, *Trees Mass.* ed. 2, ii. 458, t.

The cultivation of the Cranberry on carefully prepared bogs so arranged that they can be flooded with water at certain seasons of the year, in order to protect the plants from frost or insects, has become an important industry in the northern United States; and a number of varieties have been obtained. These differ in the size and color of the fruit and in its time of ripening. Barnstable County, Massachusetts, New Jersey and northern Michigan and Wisconsin are found more suitable for Cranberry culture than other parts of the country. (See *Garden and Forest*, iii. 511, 535; iv. 3, 525, 542.)

[3] Linnæus, *Spec.* 351 (1753). — *Fl. Dan.* i. t. 80. — Willdenow, *l. c.* 354. — Guimpel, Willdenow & Hayne, *Abbild. Deutsche Holz.* i. 58, t. 44. — Gray, *l. c.* 25. — Watson & Coulter, *l. c.* 314.

Schollera Oxycoccus, Roth, *Tent. Fl. Germ.* i. 170 (1788); ii. 442.

Vaccinium Oxycoccus, var. *ovalifolium*, Michaux, *l. c.* 228 (1803).

Oxycoccus palustris, Persoon, *l. c.* 419 (1805). — De Candolle, *l. c.* 577.

Oxycoccus vulgaris, Pursh, *l. c.* 263 (1814).

[4] Linnæus, *l. c.* (1753). — *Fl. Dan.* i. t. 40. — Willdenow, *l. c.* — *Nouveau Duhamel*, ii. 107, t. 30. — Guimpel, Willdenow & Hayne, *l. c.* 57, t. 43. — De Candolle, *l. c.* 568. — Gray, *l. c.* — Watson & Coulter, *l. c.*

Vaccinium punctatum, Lamarck, *Dict.* i. 74 (1783).

[5] Linnæus, *l. c.* 350 (1753). — *Fl. Dan.* ii. t. 231. — Willdenow, *l. c.* 350. — Guimpel, Willdenow & Hayne, *l. c.* 56, t. 42. — De Candolle, *l. c.* 574. — Gray, *l. c.* 23. — Watson & Coulter, *l. c.* 313.

Vaccinium Sednense, Persoon, *l. c.* 478 (1805).

Vaccinium pubescens, Hornemann, *Fl. Dan.* ix. t. 1516 (1820).

[6] Linnæus, *l. c.* 349 (1753). — *Fl. Dan.* vi. t. 974. — Willdenow, *l. c.* 348. — *Nouveau Duhamel*, ii. 102, t. 29. — Guimpel, Willdenow & Hayne, *l. c.* 54, t. 41. — De Candolle, *l. c.* 573. — Hooker, *Fl. Bor.-Am.* ii. 33. — Gray, *l. c.* 24.

[7] Gray, *Brewer & Watson Bot. Cal.* i. 451 (1876); *Syn. Fl. N. Am.* ii. 23.

[8] *Jour. de Pharm.* sér. 4, xviii. 439.

Vaccinium macrocarpon, which contains a bitter principle for which the name of oxycoccin has been proposed.[1] Most of the Vacciniums produce handsome flowers and fruit, and the leaves of several of the North American species assume brilliant colors in the autumn. Several are desirable garden plants, especially the High-bush Blueberry, *Vaccinium corymbosum*,[2] and the Deerberry, *Vaccinium stamineum*,[3] of eastern America, and the evergreen *Vaccinium ovatum*[4] of the Pacific regions of North America.

In North America Vaccinium escapes the attacks of disfiguring insects and serious fungal diseases.[5]

Vaccinium, the classical name of *Vaccinium Myrtillus*, was adopted by Linnæus as the name of this genus.

[1] *Am. Jour. Pharm.* 1863, 321.

[2] Linnæus, *Spec.* 350 (1753). — Wangenheim, *Nordam. Holz.* 109, t. 30, f. 68. — Watson, *Dendr. Brit.* ii. 123, t. 123. — *Bot. Mag.* lxii. t. 3433. — De Candolle, *Prodr.* vii. 571. — Emerson, *Trees Mass.* ed. 2, ii. 454, t. — Gray, *Syn. Fl. N. Am.* ii. 22. — Watson & Coulter, *Gray's Man.* ed. 6, 313.

Vaccinium disomorphum, Michaux, *Fl. Bor.-Am.* i. 231 (1803).

[3] Linnæus, *l. c.* (1753). — Willdenow, *Spec.* ii. 349. — Andrews, *Bot. Rep.* iv. t. 263. — De Candolle, *l. c.* 567. — Gray, *l. c.* 21. — Watson & Coulter, *l. c.* 312.

Vaccinium album, Pursh, *Fl. Am. Sept.* i. 285 (not Linnæus) (1814).

Vaccinium elevatum, De Candolle, *l. c.* (excl. var.) (1838).

Pricrococcus stamineus, Nuttall, *Trans. Am. Phil. Soc.* n. ser. viii. 262 (1843).

Pricrococcus elevatus, Nuttall, *l. c.* (1843).

Pricrococcus Floridanus, Nuttall, *l. c.* (1843).

[4] Pursh, *Fl. Am. Sept.* i. 290 (1814). — *Bot. Reg.* xvi. t. 1354. — Hooker, *Fl. Bor.-Am.* ii. 34. — De Candolle, *l. c.* 570. — Gray, *Brewer & Watson Bot. Cal.* i. 451; *Syn. Fl. N. Am.* ii. 25.

Vaccinium lanceolatum, De Candolle, *l. c.* (1838).

Metagonia ovata, Nuttall, *l. c.* 264 (1843).

[5] A number of curious fungi are parasitic on North American Vaccinieæ, some being peculiar to this country, and others, occurring also in Europe, being more abundant and more highly developed here. The most striking are the species of Exobasidium, the European *Exobasidium Vaccinii*, Woronin, being exceedingly common on several species of Gaylussacia and Vaccinium. This attacks the leaves, causing them to swell up and assume at first a pink color which later is powdered with the white spores. When this fungus attacks the flower it causes conspicuous although usually symmetrical distortions often believed to be the work of insects.

Several interesting Rusts are found on American Vaccinieæ. *Melampsora Vacciniorum*, Schroeter, affects the leaves of several species, and *Melampsora Gœppertiana*, Winter, causes the curious distortions popularly known as "witches' brooms," which are often of large size on the leaves of *Vaccinium corymbosum*. A number of small characteristic Discomycetes affect the leaves of Vaccinieæ in this country, which are also injured by the mildews, *Microsphæra Vaccinii*, Cooke & Peck, and by *Rhytisma Vaccinii*, Fries.

VACCINIUM ARBOREUM.

Farkleberry. Sparkleberry.

FLOWERS articulate with the pedicels, axillary and solitary or in terminal racemes; corolla open-campanulate, 5-lobed; anthers tipped with slender tubes, awned on the back; ovary imperfectly 10-celled. Berry globose, dry and astringent.

Vaccinium arboreum, Marshall, *Arbust. Am.* 157 (1785). — Michaux, *Fl. Bor.-Am.* i. 230. — Persoon, *Syn.* i. 479. — Du Mont de Courset, *Bot. Cult.* ed. 2, iii. 511. — Desfontaines, *Hist. Arb.* i. 270. — Pursh, *Fl. Am. Sept.* i. 285. — Nuttall, *Gen.* i. 263. — Elliott, *Sk.* i. 495. — Don, *Gen. Syst.* iii. 853. — De Candolle, *Prodr.* vii. 567. — Dietrich, *Syn.* ii. 1264. — Loddiges, *Bot. Cab.* xvii. t. 1885. — Gray, *Mem. Am. Acad.* n. ser. iii. 53 (*Chlor. Bor. Am.*); *Syn. Fl. N. Am.* ii. 20. — Klotzsch, *Linnæa*, xxiv. 55. — Walpers, *Ann.* ii. 1096. — Chapman, *Fl.* 259. — Curtis, *Rep. Geolog. Surv. N. Car.* 1860, iii. 87. — Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix. 96. — Watson & Coulter, *Gray's Man.* ed. 6, 312.

Vaccinium mucronatum, Walter, *Fl. Car.* 139 (not Linnæus) (1788).

Vaccinium diffusum, Aiton, *Hort. Kew.* ii. 11 (1789). — *Bot. Mag.* xxxix. t. 1607. — Koch, *Dendr.* ii. 96. — Lauche, *Deutsche Dendr.* ed. 2, 239.

(?) Arbutus obtusifolius, Rafinesque, *Fl. Ludovic.* 55 (1817).

Batodendron arboreum, Nuttall, *Trans. Am. Phil. Soc.* n. ser. viii. 261 (1843); *Sylva*, iii. 43.

A tree, twenty to thirty feet in height, with a short often crooked trunk occasionally eight or ten inches in diameter, and slender more or less contorted branches which form an irregular round head; or toward the northern limit of its range generally reduced to a low shrub with many divergent stems. The bark of the trunk, which is barely one sixteenth of an inch thick, is light reddish brown and covered with minute appressed scales. The branchlets, when they first appear, are light red and coated with pale pubescence; in their first winter they are glabrous or puberulous and bright red-brown, and later become dark red, and are marked by the minute elevated nearly orbicular leaf-scars. The winter-buds are obtuse, one sixteenth of an inch or less in length, and covered with imbricated ovate-acute chestnut-brown scales which often remain on the base of the branchlets throughout the season. The leaves are obovate, oblong-oval, or occasionally nearly orbicular, acute, or rounded and apiculate at the apex, gradually or abruptly wedge-shaped at the base, obscurely glandular-dentate, or entire with thickened slightly revolute margins; when they unfold they are light red and more or less pilose or puberulous, and at maturity they are thin, coriaceous, dark green and lustrous above, paler below, glabrous or often puberulous along the midribs and veins, which are more prominent on the upper than on the lower surface, reticulate-venulose, half an inch to two inches and a half long, a quarter of an inch to an inch broad, and sessile or borne on short broad petioles; in the southern states they remain on the branches until after the opening of the flowers in the following year, while farther north they fall during the winter. The flowers, which appear in March in Florida and in May at the northern limits of the range of the plant, are a quarter of an inch in length and are borne on slender drooping pedicels half an inch long and furnished near the middle with two minute acute scarious caducous bractlets; they are solitary in the axils of leaves of the year, or are arranged in terminal puberulous racemes two or three inches long, and produced from the axils of leafy or minute acute scarious bracts. The corolla is white, open-campanulate, slightly five-lobed, with acute reflexed lobes, and longer than the ten stamens. These are inserted on its base under the thick obscurely lobed pulvinate disk which is depressed in the centre; the filaments are hirsute and shorter than the anthers, which are long-awned on the back and tipped by two long slender tubes with oblique elongated terminal pores. The fruit ripens in October and sometimes remains on the branches until the end of winter; it is globose, a quarter of an inch in diameter, black, lustrous, and many-seeded, with dry, granular, slightly astringent flesh of a pleasant flavor.

Vaccinium arboreum is distributed from North Carolina, where it is found from the coast region to the valleys of the Alleghany Mountains in the extreme western part of the state, southward to Hernando County, Florida; it ranges through the Gulf states and from southern Illinois and Missouri through Arkansas and eastern Texas to the shores of Matagorda Bay. The Farkleberry usually inhabits moist sandy soil along the banks of ponds and streams, and is common in the Pine belt of the southern Atlantic and Gulf states, reaching its greatest development in eastern Texas near the coast. In the interior it is less common and usually of small size.

The wood of *Vaccinium arboreum* is heavy, hard, and very close-grained, with a satiny surface susceptible of receiving a beautiful polish; it contains numerous broad conspicuous medullary rays and is light brown tinged with red, with thick sapwood which is distinguished with difficulty from the heartwood. The specific gravity of the absolutely dry wood is 0.7610, a cubic foot weighing 47.42 pounds. It is sometimes used for the handles of tools and in the manufacture of other small articles in which strength and tenacity are required.

Decoctions of the astringent bark of the root and of the leaves of *Vaccinium arboreum* are sometimes used domestically in the treatment of diarrhœa, and the bark has been employed by tanners.[1]

The first description of *Vaccinium arboreum* was published by Humphrey Marshall in 1785, although according to Aiton[2] it was introduced into English gardens twenty years earlier. With its lustrous leaves and profusion of pure white flowers the Farkleberry is one of the most beautiful of the North American species of Vaccinium, and it might well be used to decorate the gardens of temperate countries; but, although once cultivated in Europe, it probably is no longer to be found outside its native home.

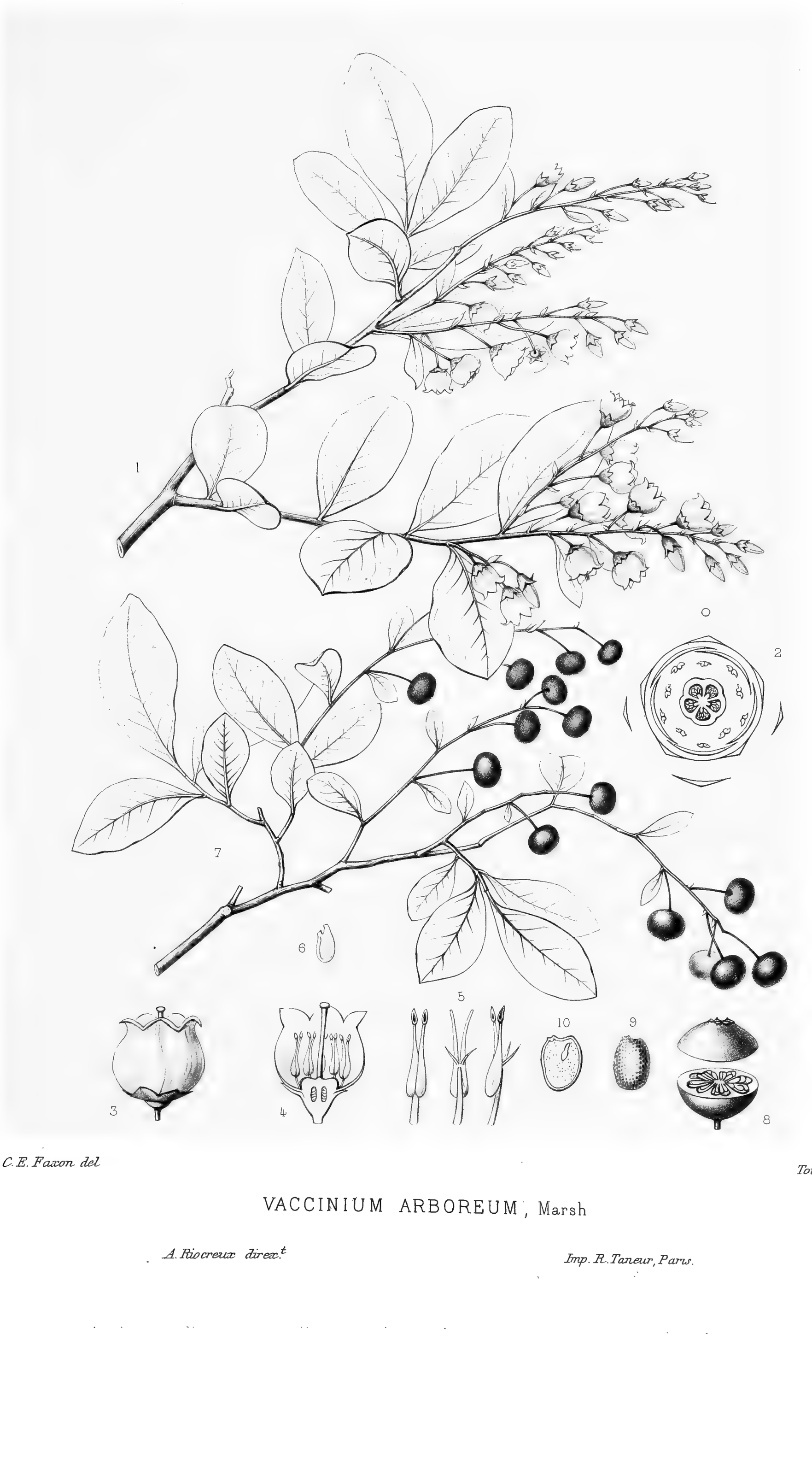
[1] Porcher, *Resources of Southern Fields and Forests*, 384.

[2] *Hort. Kew.* ii. 11. — Loudon, *Arb. Brit.* ii. 1159.

EXPLANATION OF THE PLATE.

PLATE CCXXX. VACCINIUM ARBOREUM.

1. A flowering branch, natural size.
2. Diagram of a flower.
3. A flower, enlarged.
4. Vertical section of a flower, enlarged.
5. Front, rear, and side views of a stamen, enlarged.
6. An ovule, much magnified.
7. A fruiting branch, natural size.
8. A fruit cut transversely, enlarged.
9. A seed, enlarged.
10. Vertical section of a seed, enlarged



C.E. Faxon del

Toulet sc.

VACCINIUM ARBOREUM, Marsh

A. Riocreux direx.t

Imp. R. Taneur, Paris.

ARBUTUS.

FLOWERS perfect; calyx free from the ovary, 5-parted, the divisions imbricated in æstivation; corolla gamopetalous, 5-toothed, the teeth imbricated in æstivation; stamens 10; ovary superior, 5 or rarely 4-celled; ovules numerous. Fruit drupaceous or baccate. Leaves alternate, persistent, destitute of stipules.

Arbutus, Linnæus, *Gen.* 123 (1737). — Adanson, *Fam. Pl.* ii. 165. — A. L. de Jussieu, *Gen.* 160. — Meisner, *Gen.* 247. — Endlicher, *Gen.* 756. — Bentham & Hooker, *Gen.* ii. 581. — Baillon, *Hist. Pl.* xi. 191.

Unedo, Hoffmannsegg & Link, *Fl. Port.* i. 415 (1809).

Trees or shrubs, with astringent bark exfoliating from young stems in large thin scales, smooth terete red branches, thick hard roots, and scaly buds. Leaves alternate, petiolate, entire or dentate, obscurely penniveined, persistent. Flowers small, in simple compound racemes or panicles. Pedicels clavate, bibracteolate at the base, developed from the axils of ovate bracts. Bracts and bractlets scarious, scaly, persistent. Calyx five-parted nearly to the base, the divisions ovate, acute, scarious, persistent. Corolla hypogynous, globose or ovoid-urceolate, white, rose-colored, or greenish white, five-toothed, the teeth obtuse, recurved. Stamens ten, included; filaments subulate, dilated and pilose at the base, free, inserted in the bottom of the corolla; anthers short, compressed laterally, attached on the back below the apex, dorsally two-awned, introrse, two-celled, the cells opening at the top anteriorly by a terminal pore; pollen-grains compound. Ovary superior, glandular-roughened, glabrous or tomentose, sessile or slightly immersed in a glandular ten-lobed disk; style columnar, simple, exserted, stigmatose and obscurely five-lobed at the apex; ovules numerous, attached to a central placenta developed from the inner angle of each cell, amphitropous; raphe ventral; micropyle superior. Fruit drupaceous or baccate,[1] globose, smooth or glandular-coated, five-celled, many-seeded; exocarp firm, dry, and mealy; endocarp cartilaginous, often incompletely developed. Seed small, compressed or angled, narrowed and often apiculate at the apex; testa coriaceous, dark red-brown, slightly pilose. Embryo axile in copious horny albumen, clavate; radicle terete, erect, turned towards the hilum.

Ten or twelve species of Arbutus are distinguished; they inhabit the western and southern parts of North America, where in Mexico[2] the largest number of species occur, Central America, eastern, southern, and southwestern Europe,[3] Asia Minor,[4] northern Africa,[5] and the Canary Islands.[6] Three species grow naturally within the territory of the United States; two of these are Mexican, and find their most northern home just north of our southern boundary, one in Texas and the other in Arizona, and the third inhabits the coast forests of the Pacific states and British Columbia.

Arbutus produces hard close-grained valuable wood often used as charcoal in the manufacture of gunpowder. In the south of Europe the strawberry-shaped fruits of the European and north African *Arbutus Unedo*[7] are eaten raw or cooked, and possess narcotic properties; the bark and leaves are

[1] The fruit of Arbutus has generally been described as baccate. That of the Old World *Arbutus Unedo* is usually a berry, although it sometimes contains traces of a thin crustaceous imperfect endocarp, which in *Arbutus Andrachne* is more developed. In the fruits of all the American species which I have been able to examine there is a distinct more or less complete endocarp, which appears to be most developed in *Arbutus Menziesii*, in which it is often a distinct five-celled stone with thin papery walls.

[2] Humboldt, Bonpland & Kunth, *Nov. Gen. et Spec.* iii. 279. — Hemsley, *Bot. Biol. Am. Cent.* ii. 276.

[3] Nyman, *Conspect. Fl. Europ.* 490.

[4] Boissier, *Fl. Orient.* iii. 965.

[5] Desfontaines, *Fl. Atlant.* i. 340.

[6] Link, *Buch Phys. Beschr. Canar. Ins.* 146, 180. — Webb & Berthelot, *Phytogr. Canar.* sec. iii. 11.

[7] Linnæus, *Spec.* 395 (1753). — *Nouveau Duhamel*, i. 73, t. 21. —

used as astringents.[1] The fruit of the Oriental *Arbutus Andrachne*[2] is edible, and its wood is used for fuel.

Arbutus is chiefly valuable for the beauty of its smooth red branches, evergreen foliage, and large clusters of white flowers, and the two European species have been cultivated in gardens since the time of the ancients.[3]

Arbutus, the classical Latin name of the species of southern Europe, was adopted by Linnæus as the name of the genus.

Savi, *Flora Italiana*, i. t. 5. — Sibthorp, *Fl. Græc.* iv. 66, t. 373. — *Bot. Mag.* xlix. t. 2319. — De Candolle, *Prodr.* vii. 581.

Arbutus serratifolia, Salisbury, *Prodr.* 288 (1796). — Loddiges, *Bot. Cab.* vi. t. 580.

Unedo edulis, Hoffmannsegg & Link, *Fl. Port.* i. 415 (1809).

[1] Loudon, *Arb. Brit.* ii. 1119.

[2] Linnæus, *Spec.* ed. 2, 566 (1762). — Savi, *l. c.* t. 12. — *Nouveau Duhamel*, i. 76, t. 22. — *Bot. Reg.* ii. t. 113. — *Bot. Mag.* xlvi. t. 2024. — Sibthorp, *l. c.* 67, t. 374. — De Candolle, *l. c.* 582.

Arbutus integrifolia, Salisbury, *l. c.* (1796).

[3] Loudon, *l. c.* 1118.

CONSPECTUS OF NORTH AMERICAN SPECIES.

Ovary glabrous; leaves oval or oblong, entire or rarely serrate	1. ARBUTUS MENZIESII.
Ovary pubescent; leaves oval, ovate, or lanceolate	2. ARBUTUS XALAPENSIS.
Ovary glabrous, conspicuously porulose; leaves lanceolate or rarely narrowly oblong	3. ARBUTUS ARIZONICA.

ARBUTUS MENZIESII.

Madroña.

Ovary glabrous. Leaves oval or oblong, entire or rarely serrate.

Arbutus Menziesii, Pursh, *Fl. Am. Sept.* i. 282 (1814). — Sprengel, *Syst.* ii. 286. — Don, *Gen. Syst.* iii. 834. — De Candolle, *Prodr.* vii. 582. — Dietrich, *Syn.* ii. 1387. — Hooker, *Fl. Bor.-Am.* ii. 36. — Hooker & Arnott, *Bot. Voy. Beechey*, 143. — Klotzsch, *Linnæa*, xxiv. 72. — Nuttall, *Sylva*, iii. 42, t. 95. — Torrey, *Pacific R. R. Rep.* iv. 116; *Bot. Wilkes Explor. Exped.* 378. — Newberry, *Pacific R. R. Rep.* vi. 23, 79, f. 22. — Cooper, *Pacific R. R. Rep.* xii. pt. ii. 29, 66. — Lyall, *Jour. Linn. Soc.* vii. 131. — Gray, *Brewer & Watson Bot. Cal.* i. 452 (in part); *Syn. Fl. N. Am.* ii. 27 (in part). — Hall, *Bot. Gazette*, ii. 88. — Hemsley, *Bot. Biol. Am. Cent.* ii. 276 (in part). — Sargent, *Forest Trees N. Am. 10th Census U. S.* ix. 97.

Arbutus procera, Lindley, *Bot. Reg.* xxi. t. 1753 (1836). — Loudon, *Arb. Brit.* ii. 1121. — De Candolle, *Prodr.* vii. 582. — Dietrich, *Syn.* ii. 1387. — Paxton, *Mag. Bot.* ii. 147, t. — Walpers, *Rep.* vi. 416. — Klotzsch, *Linnæa*, xxiv. 71.

Arbutus laurifolia, Hooker, *Fl. Bor.-Am.* ii. 36 (not Lindley) (1840).

A tree, eighty to a hundred and ten feet in height, with a tall straight trunk four to seven feet in diameter and upright or spreading stout branches which form a narrow oblong or broad round-topped head. The bark of old trunks varies from one third to one half of an inch in thickness, and has a dark reddish brown surface broken into small thick plate-like scales; that of young stems and of the branches is smooth and bright red, and separates into large thin scales. The branchlets, when they first appear, are light red, pea-green, or orange-colored, and are glabrous, or on vigorous young plants are sometimes covered with pale scattered hairs which usually soon disappear; in their first winter they turn bright red-brown. The winter-buds are obtuse, a third of an inch long, and covered by many imbricated broadly ovate bright brown scales which are keeled on the back, apiculate at the apex, and slightly ciliate on the margins. The leaves are oval or oblong, rounded or contracted into short points at the apex, and rounded, subcordate, or wedge-shaped at the base, with slightly thickened revolute entire, crenate, or occasionally on young plants sharply serrate margins; when they unfold they are light green or often pink, especially on the lower surface, and are glabrous or slightly puberulous, and at maturity they are thick and coriaceous, dark green and lustrous above, pale or often nearly white below, three to five inches long and an inch and a half to three inches wide, with thick pale midribs rounded on the upper side, and conspicuously reticulated veinlets; they are borne on stout grooved petioles half an inch to an inch in length and often slightly wing-margined towards their apex; and, appearing in early spring, remain on the branches until midsummer of their second year, when they begin, gradually and irregularly, to turn to an orange or scarlet color, and to fall. The flowers appear from March at the south to May at the north, and are borne on short slender puberulous pedicels produced from the axils of acute scarious bracts with ciliate margins, and gathered in spicate pubescent racemes which form a terminal cluster five or six inches in length and breadth; they are a third of an inch long, with scarious white calyx-lobes, white globular corollas, and glabrous ovaries. The fruit, which is drupaceous, ripens in the autumn and is subglobose or occasionally obovate or oval, half an inch long, bright orange-red, and covered with thin glandular flesh surrounding a five-celled more or less perfectly developed thin-walled cartilaginous stone, containing in each cell several seeds tightly pressed together and angled, and covered with dark brown pilose coats.

Arbutus Menziesii is distributed from the islands of the British Columbia coast at Seymour

Narrows[1] southward through the coast region of Washington and Oregon, and through the California coast ranges to the Santa Lucia Mountains. It usually grows on high well-drained slopes in rich soil and attains its greatest size in the fog-swept coast region of northern California, where it is a common inhabitant of the Redwood forest;[2] farther north and south and on the dry eastern slopes of the California mountains it is much smaller, and in the region south of the Bay of San Francisco it is often shrubby in habit.[3]

The wood of *Arbutus Menziesii* is heavy, hard, strong, and close-grained; it contains numerous conspicuous medullary rays, and is light brown shaded with red, with thin lighter colored sapwood composed of eight to twelve layers of annual growth. The specific gravity of the absolutely dry wood is 0.7052, a cubic foot weighing 43.95 pounds. It is inclined to check badly in drying, but is used for furniture, and largely for charcoal in the manufacture of gunpowder, for which purpose it is considered especially valuable. The bark is sometimes employed in tanning leather.

Arbutus Menziesii was discovered near the mouth of the Columbia River late in the last century by Archibald Menzies,[4] the surgeon of Vancouver, on his voyage of discovery. Thirty years later it was introduced by David Douglas[5] into the gardens of Europe, where it is occasionally cultivated, and where it has produced flowers and fruit.[6]

Arbutus Menziesii is the noblest of all its race; no other inhabitant of the North American forests with persistent leaves and petalous flowers equals it in size; and among our evergreen trees only the great Magnolia of the southern Atlantic states, the Kalmia, and the Rhododendron, produce more beautiful blossoms. Its dark red bark and smooth red branches, its lustrous foliage, abundant white flowers, and ample clusters of brilliant fruit, make the California Madroña an object of remarkable beauty at all seasons of the year, and one of the most desirable trees for the decoration of the parks and gardens of temperate regions.[7]

[1] G. M. Dawson, *Canadian Nat.* n. ser. ix. 331. — Macoun, *Cat. Can. Pl.* i. 294.

[2] *Garden and Forest*, iii. 515.

[3] The largest specimen of the Madroña of which there are measurements stands on the slopes of Mt. Tamalpais, in the grounds of the reservoir of the town of San Rafael, in Marin County, California. This remarkable tree is more than one hundred feet high; the branches cover a spread of ninety feet in one direction and seventy-five in the other, and the trunk girts twenty-three feet at three feet above the surface of the ground. (See *Garden and Forest*, v. 146, f. 23.)

[4] See ii. 90.

[5] See ii. 94.

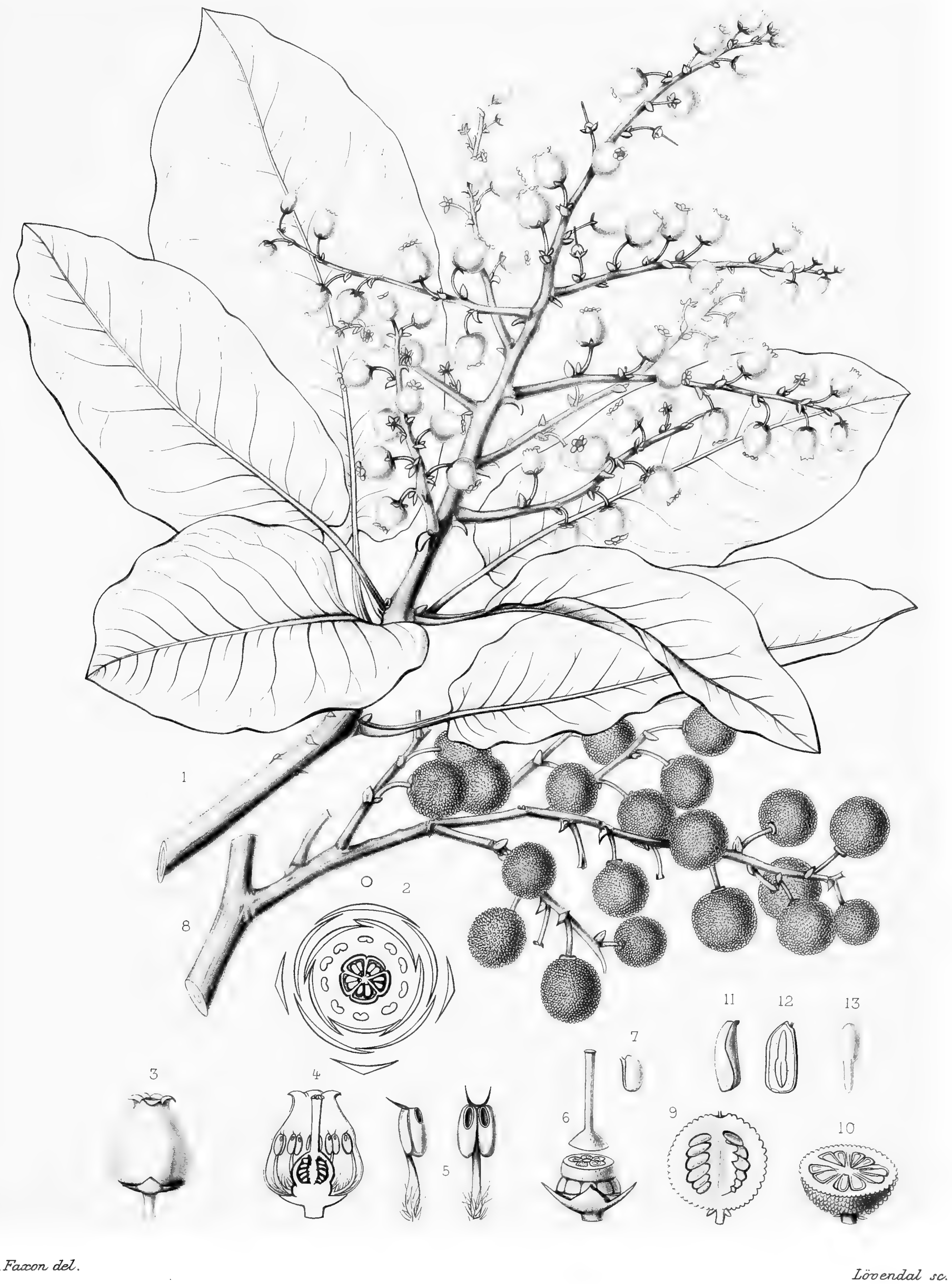
[6] Loudon, *Arb. Brit.* ii. 1122. — André, *Rev. Hort.* 1893, 149, f. 53, 54.

[7] Kellogg, *Forest Trees of California*, 96.

EXPLANATION OF THE PLATE.

Plate CCXXXI. Arbutus Menziesii.

1. A flowering branch, natural size.
2. Diagram of a flower.
3. A flower, enlarged.
4. Vertical section of a flower, enlarged.
5. A stamen, side and front views, enlarged.
6. A flower, the corolla removed, cut transversely through the ovary, enlarged.
7. An ovule, much magnified.
8. A branch of a fruit-cluster, natural size.
9. Vertical section of a fruit, slightly enlarged.
10. Cross section of a fruit, slightly enlarged.
11. A seed, enlarged.
12. Vertical section of a seed, enlarged.
13. An embryo, much magnified.



C.E.Faxon del. Lövendal sc.

ARBUTUS MENZIESII, Pursh.

A.Riocreux dirext. Imp. R.Taneur, Paris.

ARBUTUS XALAPENSIS.

Madroña.

OVARY pubescent. Leaves oval, ovate, or lanceolate.

Arbutus Xalapensis, Humboldt, Bonpland & Kunth, *Nov. Gen. et Spec.* iii. 279 (1818). — Kunth, *Syn. Pl. Æquin.* ii. 327. — Sprengel, *Syst.* ii. 286. — Don, *Gen. Syst.* iii. 835. — Bentham, *Pl. Hartweg.* 66. — De Candolle, *Prodr.* vii. 583. — Dietrich, *Syn.* ii. 1388. — Walpers, *Ann.* ii. 1105. — *Jour. Hort. Soc. Lond.* v. 192, t. 8. — Klotzsch, *Linnæa*, xxiv. 72. — Hemsley, *Bot. Biol. Am. Cent.* ii. 277. — Watson, *Proc. Am. Acad.* xviii. 111. — Havard, *Proc. U. S. Nat. Mus.* viii. 524.

Arbutus mollis, Humboldt, Bonpland & Kunth, *Nov. Gen. et Spec.* iii. 280 (1818). — Sprengel, *Syst.* ii. 286. — De Candolle, *Prodr.* vii. 582. — Dietrich, *Syn.* ii. 1388. — *Bot. Mag.* lxxvii. t. 4595. — Klotzsch, *Linnæa*, xxiv. 72. — Hemsley, *Bot. Biol. Am. Cent.* ii. 277.

Arbutus varians, Bentham, *Pl. Hartweg.* 77 (1839). — Klotzsch, *Linnæa*, xxiv. 72. — Hemsley, *Bot. Biol. Am. Cent.* ii. 277.

Arbutus laurifolia, Lindley, *Bot. Reg.* xxv. t. 67 (not Linnæus f.) (1839).

(?) **Arbutus macrophylla**, Martens & Galeotti, *Bull. Acad. Brux.* ix. pt. i. 534 (1842). — Walpers, *Rep.* ii. 725.

(?) **Arbutus prunifolia**, Klotzsch, *Linnæa*, xxiv. 73 (1851). — Hemlsey, *Bot. Biol. Am. Cent.* ii. 277.

Arbutus Menziesii, Torrey, *Bot. Mex. Bound. Surv.* 108 (1859) (not Pursh). — Gray, *Brewer & Watson Bot. Cal.* i. 452 (in part); *Syn. Fl. N. Am.* ii. 27 (in part).

Arbutus Texana, Buckley, *Proc. Phil. Acad.* 1861, 460. — Gray, *Proc. Phil. Acad.* 1862, 165. — Sargent, *Forest Trees N. Am. 10th Census U. S.* ix. 97.

Arbutus Xalapensis, var. **Texana**, Gray, *Syn. Fl. N. Am.* ed. 2, i. pt. ii. 397 (1886). — Coulter, *Contrib. U. S. Nat. Herb.* ii. 253 (*Man. Pl. W. Texas*).

A bushy tree, in Texas rarely more than eighteen or twenty feet in height, with a short, often crooked trunk eight or ten inches in diameter, separating, a foot or two above the ground, into several stout spreading branches; or often a broad irregularly shaped bush sending up numerous contorted stems. At the base of old trunks the bark is sometimes a quarter of an inch thick, deeply furrowed, dark brown on the surface, and broken into thick square plates; on younger stems and on the branches it is much thinner and tinged with red, and separates into large papery scales, exposing the light red or flesh-colored inner bark. The branchlets, when they first appear, are light red and thickly coated with pubescence, and later are covered with dark red-brown bark which divides into small plate-like scales. The leaves are oval, ovate, or lanceolate, rounded, acute, and often apiculate at the apex and rounded or wedge-shaped at the base, with slightly thickened margins which are usually entire or sometimes are remotely crenulate-toothed, or are coarsely serrate with a few obtuse teeth mostly above the middle; when they unfold they are often tinged with red, especially on the petioles, midribs, and margins, and are sometimes pubescent on the lower surface, along the upper side of the midribs, and on the petioles; at maturity they are thick and coriaceous, dark green, lustrous and glabrous above, pale and glabrous or covered with pale or cinereous pubescence below, an inch to three inches in length and from two thirds of an inch to an inch and a half in breadth, with thick light-colored midribs slightly rounded and sometimes puberulous on the upper side, reticulate veinlets, and stout glabrous pubescent petioles an inch or an inch and a half long and often furnished towards the apex with several dark glands. The flowers, which in Texas appear in March, are borne on stout reddish pubescent recurved pedicels developed from the axils of ovate acute scarious persistent bracts, and arranged in a compact terminal conical pubescent panicle two or two and a half inches long, the lower branches of which are developed from the axils of upper leaves; the flowers are a third of an inch in length, with acute scarious calyx-lobes ciliate on their margins, an oblong white corolla more or less abruptly contracted above the middle, and an ovary sparingly or densely covered with long white scattered hairs. The

fruit, which is usually produced very sparingly, ripens in summer, and is dark red and a third of an inch in diameter; it is drupaceous, with thin granular flesh and a rather thick more or less completely formed five-celled stone containing numerous puberulous compressed seeds in each cell.

In Texas, where it is a rare and local plant, *Arbutus Xalapensis* is scattered over dry limestone hills from Travis County and the valley of the Rio Blanco in Hays County westward to the Guadaloupe and Eagle Mountains. It is common on the Sierra Madre in Nuevo Leon, ranging southward to the mountains near Jalapa, where it was discovered by Humboldt and Bonpland.

The wood of *Arbutus Xalapensis* is heavy, hard, close-grained, and contains numerous obscure medullary rays; it is brown tinged with red, with lighter colored sapwood composed of ten or twelve layers of annual growth. The specific gravity of the absolutely dry wood is 0.7500, a cubic foot weighing 46.75 pounds. It is sometimes used in Texas for the handles of small tools and in the manufacture of mathematical instruments, and by the Mexicans for wooden stirrups.

Arbutus Xalapensis was discovered in Texas in the valley of the Limpia River by Mr. Charles Wright,[1] the botanist of the United States and Mexican Boundary Survey, in June, 1851, although it was not distinguished from the California species until some years later, when it was found in the valley of the Rio Blanco in Hays County by Mr. S. B. Buckley.[2]

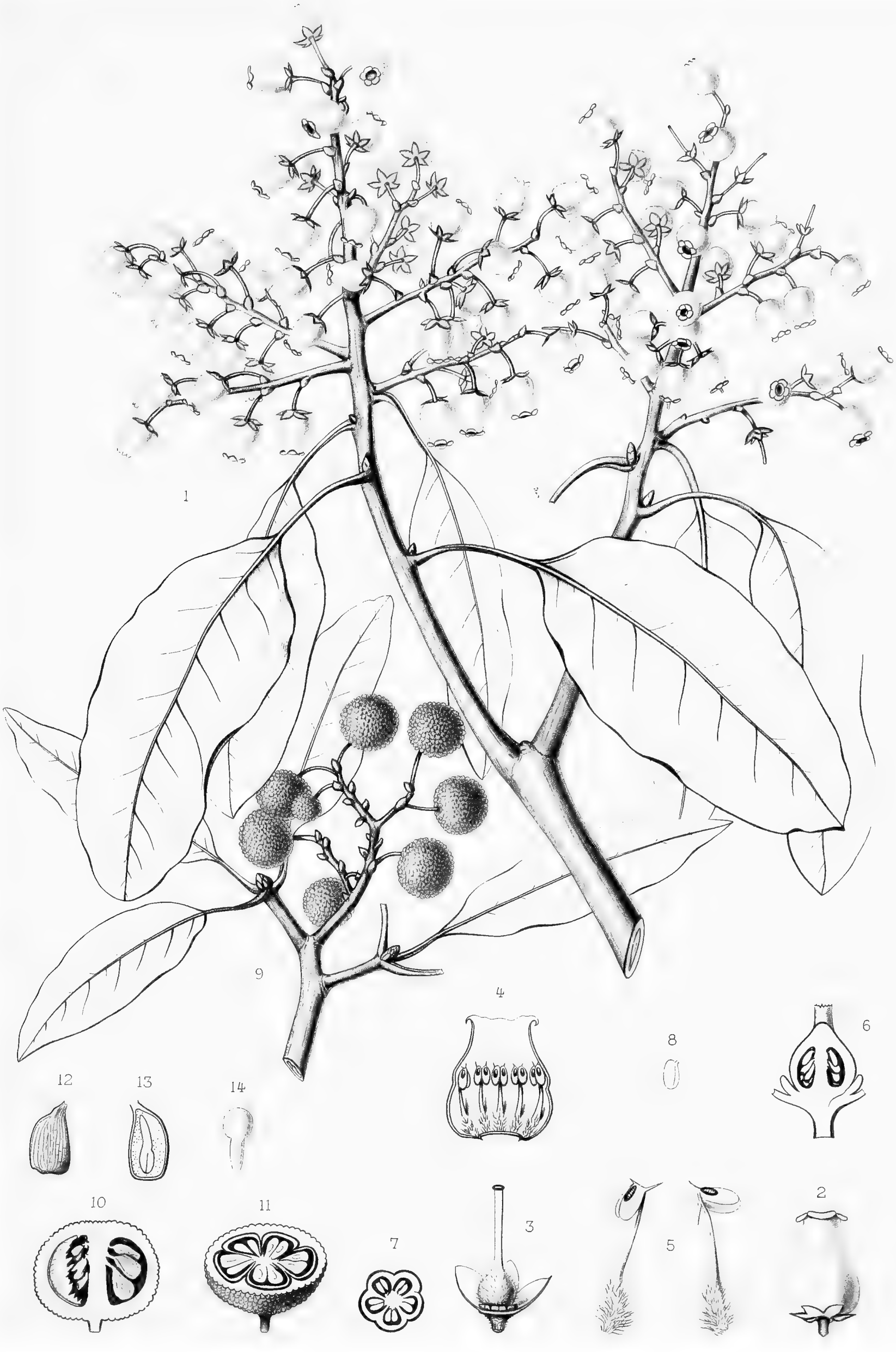
[1] See i. 94.

[2] See iii. 3.

EXPLANATION OF THE PLATE.

Plate CCXXXII. Arbutus Xalapensis.

1. A flowering branch, natural size.
2. A flower, enlarged.
3. A flower, the corolla and tube of the calyx-lobes removed, enlarged.
4. Vertical section of a corolla with stamens displayed.
5. Side views of a stamen, enlarged.
6. Vertical section of an ovary, enlarged.
7. Cross section of an ovary, enlarged.
8. An ovule, much magnified.
9. A fruiting branch, natural size.
10. Vertical section of a fruit, enlarged.
11. Cross section of a fruit, enlarged.
12. A seed, enlarged.
13. Vertical section of a seed, enlarged.
14. An embryo, much magnified.



C E. Faxon del. *Lövendal sc.*

ARBUTUS XALAPENSIS, H.B.K.

A. Riocreux direx.t *Imp. R. Taneur, Paris.*

ARBUTUS ARIZONICA.

Madroña.

OVARY glabrous, conspicuously porulose. Leaves lanceolate or rarely narrowly oblong.

Arbutus Arizonica, Sargent, *Garden and Forest*, iv. 317, f. 54 (1891).

Arbutus Menziesii, Rothrock, *Wheeler's Rep.* vi. 25, 183 (not Pursh) (1878). — Gray, *Brewer & Watson Bot. Cal.* i. 452 (in part); *Syn. Fl. N. Am.* ii. 27 (in part).

Arbutus **Xalapensis**, Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix. 97 (not Humboldt, Bonpland & Kunth) (1884).

Arbutus **Xalapensis**, var. **Arizonica**, Gray, *Syn. Fl. N. Am.* ed. 2, i. pt. ii. 396 (1886).

A tree, forty or fifty feet in height, with a tall straight trunk eighteen to twenty-four inches in diameter, stout spreading branches which form a rather compact round-topped head, and thick tortuous divergent branchlets. The bark of the trunk, which varies from one third to one half of an inch in thickness and is irregularly broken by longitudinal furrows, is divided into square appressed plate-like scales, and is light gray or nearly white and faintly tinged with red on the surface. The bark of young stems and of the branches is thin, smooth, and dark red, and exfoliates in large thin scales. The branchlets, when they first appear, are reddish brown and more or less pubescent, or are light purple and pilose with a glaucous bloom, and by the end of their first season are covered with bright red bark which separates freely into thin irregularly shaped more or less persistent scales. The leaves are lanceolate or rarely oblong, acute or rounded and apiculate at the apex, and wedge-shaped or occasionally rounded at the base, with thickened entire or rarely denticulate margins; when they unfold they are membranaceous, tinged with red, and slightly puberulous especially on the petioles and margins; and at maturity they are thin, firm, and rigid, glabrous, light green on the upper surface, pale on the lower surface, an inch and a half to three inches long and half an inch to an inch wide, with slender yellow midribs and obscure reticulate veinlets, and are borne on slender petioles often an inch in length; they appear in May and after the summer rains in September, and remain for at least one year on the branches. The flowers, which expand in May, are borne on short stout hairy pedicels developed from the axils of conspicuous ovate rounded scarious bracts, and are collected in rather loose terminal clusters two or two and a half inches in length and breadth, their lower branches from the axils of the upper leaves; they are a quarter of an inch long, with scarious calyx-lobes, ovate white corollas often much contracted in the middle, conspicuously lobed disks, and glabrous porulose ovaries. The fruit ripens in October and November, and is drupaceous, globose or oblong, dark orange-red, porulose, with thin sweetish flesh, a papery five-celled usually incompletely developed stone, and compressed puberulous seeds.

Arbutus Arizonica inhabits the Santa Catalina and the Santa Rita Mountains of southern Arizona, where, associated with *Quercus grisea*, *Quercus Emoryi*, *Quercus chrysolepis*, and *Pinus ponderosa*, it grows on dry gravelly benches at elevations of from six to eight thousand feet above the sea; and ranges southward along the Sierra Madre of Chihuahua.[1]

The wood of *Arbutus Arizonica* is heavy and close-grained although soft and brittle; it contains numerous obscure medullary rays, and is light brown tinged with red, with lighter colored sapwood composed of thirty to forty layers of annual growth. The specific gravity of the absolutely dry wood is 0.7099, a cubic foot weighing 44.24 pounds.

[1] Here it was found at an elevation of eight thousand feet by Mr. C. G. Pringle in 1885.

The Arizona Madroña was first noticed in southern Arizona in June, 1851, by Dr. George Thurber,[1] while he was attached as botanist to the United States and Mexican Boundary Survey, and for many years was confounded with the species of the Pacific coast region. In its habit, which is that of a small White Oak, and in the color of its bark, it is one of the most distinct species of the genus. The contrast in color between the white bark of the trunk and the bright red branches and pale green leaves makes this tree a remarkable and beautiful object at all seasons of the year; and in the spring when the pure white flowers are expanded, and late in the autumn when its branches are covered with clusters of brilliant fruit, it is particularly beautiful.

[1] See iii. 36.

EXPLANATION OF THE PLATE.

PLATE CCXXXIII. ARBUTUS ARIZONICA.

1. A flowering branch, natural size.
2. Vertical section of a flower, enlarged.
3. A flower, the corolla removed, enlarged.
4. A stamen, enlarged.
5. A fruiting branch, natural size.
6. Vertical section of a fruit, enlarged.
7. A seed, enlarged.
8. Vertical section of a seed, enlarged.
9. An embryo, much magnified.

C.E.Faxon del. *Picart sc.*

ARBUTUS ARIZONICA, Sarg.

A.Riocreux direx.t *Imp. R.Taneur, Paris.*

ANDROMEDA.

FLOWERS perfect; calyx 5-toothed, or 5-parted nearly to the base, the divisions valvate in æstivation; corolla globular, urceolate, or nearly cylindrical, 5-toothed or lobed, the lobes imbricated in æstivation; stamens 8 to 10; ovary superior, 5-celled; ovules numerous. Leaves alternate, deciduous or persistent, destitute of stipules.

Andromeda, Linnæus, *Gen.* 123 (excl. *Cassandra*, *Cassiope*, and *Leucothoe*) (1737). — A. L. de Jussieu, *Gen.* 160 (excl. *Cassandra*, *Cassiope*, and *Leucothoe*). — Endlicher, *Gen.* 755 (excl. sec. *Cassiope*, *Cassandra*, *Leucothoe*, and *Agarista*). — Bentham & Hooker, *Gen.* ii. 587. — Baillon, *Hist. Pl.* xi. 177.

Rhododendros, Adanson, *Fam. Pl.* ii. 164 (in part) (1763).

Lyonia, Nuttall, *Gen.* i. 266 (not Rafinesque nor Elliott) (1818). — Meisner, *Gen.* 246. — Endlicher, *Gen.* 755. — Bentham & Hooker, *Gen.* ii. 587.

Zolisma, Rafinesque, *Am. Monthl. Mag. and Crit. Rev.* iv. 193 (1819); *Jour. Phys.* lxxxix. 259.

Zenobia, D. Don, *Edinburgh New Phil. Jour.* xvii. 158 (1834). — Meisner, *Gen.* 246. — Bentham & Hooker, *Gen.* ii. 587. — Baillon, *Hist. Pl.* xi. 177.

Pieris, D. Don, *Edinburgh New Phil. Jour.* xvii. 159 (1834). — Meisner, *Gen.* 246. — Bentham & Hooker, *Gen.* ii. 588.

Pieridia, Reichenbach, *Deutsch. Botan.* 127 (1841).

Portuna, Nuttall, *Trans. Am. Phil. Soc.* n. ser. viii. 268 (1843).

(?) **Ægialea**, Klotzsch, *Linnæa*, xxiv. 17 (1851). — Walpers, *Ann.* ii. 1113.

Small trees, or shrubs, with terete branchlets and fibrous roots. Leaves alternate, entire or serrate, petiolate, membranaceous or coriaceous, deciduous or persistent. Flowers in axillary and terminal umbellate fascicles or panicled racemes. Pedicels slender, produced from the axils of ovate acute bracts, and bibracteolate at the base. Calyx free, persistent, five-toothed or parted nearly to the bottom, the divisions ovate-acute, sometimes herbaceous. Corolla gamopetalous, deciduous, globose or ovate-urceolate or nearly cylindrical, five-toothed or five-lobed, glabrous, pubescent, or glandular, white or rose-colored. Stamens eight or ten, included; filaments flat, broad or narrow, usually slightly adnate to the base of the corolla, often bearded, narrowed or dilated at the base, sometimes geniculate, and often furnished below the apex with two horn-like appendages; anthers short, oblong or lanceolate, attached on the back, two-celled, introrse, the cells opening below the apex by two oblong pores, furnished on the back with one ascending deflexed awn or with two ascending awn-like appendages, or muticous; pollen grain compound. Disk ten-lobed. Ovary five-celled, depressed in the centre; style columnar, tipped with a simple truncate stigma; ovules numerous in each cell, attached to a placenta borne next the summit or near the middle of the axis, anatropous; raphe ventral; micropyle superior. Fruit dry, capsular, ovoid, globose or subglobose, many-seeded, loculicidally five-valved, the valves septiferous and separating from the placentiferous axis, sometimes five-ribbed by the thickening of the valves at the dorsal sutures, the ribs more or less separable in dehiscence. Seeds pendulous or spreading in all directions, oval, sometimes angled or scobiform; testa crustaceous, smooth and shining, or loose, thin, reticulate, and sometimes produced at both ends beyond the nucleus. Embryo axile in fleshy albumen, cylindrical, elongated; cotyledons much shorter than the terete radicle, turned towards the hilum.[1]

About twenty species of Andromeda, as the genus is here regarded, are distinguished; they are chiefly confined to the temperate and southern parts of eastern North America, to the mountains of

[1] The following sections of Andromeda, by many authors considered genera, were established by Asa Gray (*Syn. Fl. N. Am.* ii. 30):—

EUANDROMEDA. Calyx small, deeply 5-parted; corolla globose-urceolate; filaments bearded, without appendages; anthers short, each cell surmounted by an ascending awn-like appendage; placentas attached near the apex of the axis; ovules and seeds turned in all directions. Capsule globose, 5-lobed. Leaves linear, persistent. A single species, in all boreal and sub-Arctic regions.

Mexico[1] and the West Indies,[2] and to the Himalayas,[3] the Malay Peninsula, China,[4] and Japan,[5] although one species[6] is found in all temperate and sub-Arctic regions of the northern hemisphere. Andromeda was once more generally distributed over the surface of the earth, the traces of a number of species being found in the cretaceous and tertiary remains of northwestern and central North America,[7] where the genus is now represented by a single species, and in the tertiary remains of southern Europe.[8] All the sections of the genus are represented in the flora of eastern North America, where eight species occur ;[9] one of these is a small tree.

Andromeda has few useful properties. The leaves and buds of *Andromeda ovalifolia*,[10] a small tree of the Himalayas, Burmah, China, and Japan, are poisonous to goats in India ; an infusion of the leaves is employed externally in the treatment of cutaneous diseases, and the young leaves are used to destroy insects.[11] In North America leaves of the Stagger Bush, *Andromeda Mariana*,[12] are popularly supposed to poison lambs and calves. Most of the species of Andromeda produce handsome foliage and beautiful flowers often arranged in ample clusters, and their value as garden plants is recognized in all temperate regions. In North America Andromeda is not seriously injured by insects or by fungal diseases.[13]

The generic name was adopted by Linnæus in fanciful allusion to the fable of Andromeda.[14]

ZENOBIA. Calyx small, 5-parted, corolla open-campanulate, obtusely 5-lobed ; filaments naked, dilated at the base ; anthers lanceolate, each cell surmounted by two ascending awn-like appendages; placentas attached to the middle of the short axis. Capsule depressed-globose, obtusely 5-lobed. Leaves deciduous, often covered with a dense glaucous bloom. A single species of the coast region of the south Atlantic states.

PORTUNA. Calyx deeply 5-parted ; corolla ovate-urceolate, 5-toothed ; filaments without appendages ; anthers oblong, each cell with a reflexed awn-like appendage on the back ; placentas attached near the apex of the axis. Capsule globose. Seed mostly scobiform. Leaves coriaceous, persistent. Eastern North America, Himalayas, China, and Japan.

PIERIS. Calyx divided nearly to the base into five sometimes herbaceous sepals ; corolla ovate-urceolate to cylindrical, 5-toothed; filaments mostly pubescent or ciliate, generally furnished near the apex with two spreading recurved awn-like appendages ; anthers oblong ; placentas usually borne above the middle of the axis. Capsule 5-angled and ridged on the dorsal sutures. Seeds scobiform or oblong. Leaves deciduous. Eastern North America, Mexico, Himalayas, China, and Japan.

LYONIA. Calyx 5 or rarely 4-lobed ; corolla globular to urceolate, pubescent or glandular ; filaments flat and, like the short anthers, without appendages ; placentas at the apex of the axis. Capsule 5-angled and ridged on the dorsal sutures, the ridges separable in dehiscence. Seeds pendulous, scobiform. Leaves persistent or deciduous. Eastern North America, West Indies, and Mexico.

[1] Hemsley, *Bot. Biol. Am. Cent.* ii. 281.

[2] Grisebach, *Fl. Brit. W. Ind.* 142 (Lyonia); *Cat. Pl. Cub.* 50.

[3] Hooker f. *Fl. Brit. Ind.* iii. 460 (Pieris).

[4] Forbes & Hemsley, *Jour. Linn. Soc.* xxvi. 16 (Pieris).

[5] Franchet & Savatier, *Enum. Pl. Jap.* i. 284.

[6] *Andromeda polifolia*, Linnæus, *Spec.* 393 (1753). — *Fl. Dan.* i. t. 54. — *Nouveau Duhamel*, i. 183, t. 38. — Hayne, *Arzn.* iii. 22. t. 22. — Guimpel, Willdenow & Hayne, *Abbild. Deutsche Holz.* i. 72, t. 55. — De Candolle, *Prodr.* vii. 606. — Franchet & Savatier, *l. c.* — Gray, *Syn. Fl. N. Am.* ii. 31. — Watson & Coulter, *Gray's Man.* ed. 6, 316.

Andromeda rosmarinifolia, Pursh, *Fl. Am. Sept.* i. 291 (1814).

Andromeda glaucophylla, Link, *Enum.* i. 394 (1821).

[7] Heer, *Phyll. Crét. du Neb.* 18, t. 1, f. 5. — Lesquereux, *U. S. Geolog. Rep.* vi. 88, t. 23, f. 6, 7 ; t. 28, f. 15 ; *Rep. U. S. Geolog. Surv.* viii. 60, t. 2, f. 5 ; 175, t. 34, f. 10, 11 (*Contrib. Foss. Fl. Western Territories*).

[8] Zittel, *Handb. Palæontolog.* ii. 722, f. 376, 377.

[9] Gray, *l. c.* 30.

[10] Wallich, *Asiat. Res.* xiii. 391, f. (1820). — Wight, *Icon. Pl. Ind. Orient.* t. 1199. — Maximowicz, *Bull. Acad. Sci. St. Pétersbourg*, xviii. 50 (*Mél. Biol.* viii. 620). — Franchet & Savatier, *l. c.* 285.

Pieris ovalifolia, D. Don, *Edinburgh New Phil. Jour.* xvii. 159 (1834). — Don, *Gen. Syst.* iii. 832. — De Candolle, *l. c.* — Kurz, *Forest Fl. Brit. Burm.* ii. 92. — Hooker f. *l. c.* 460. — Forbes & Hemsley, *l. c.* 17.

Andromeda elliptica, Siebold & Zuccarini, *Abhand. Akad. Münch.* iv. pt. iii. 126 (1846).

[11] Brandis, *Forest Fl. Brit. Ind.* 280.

[12] Linnæus, *l. c.* (1753). — Michaux, *Fl. Bor.-Am.* i. 256. — *Bot. Mag.* xxxviii. t. 1579. — *Nouveau Duhamel*, i. 177, t. 37. — Guimpel, Otto & Hayne, *Abbild. Holz.* 138, t. 113. — Gray, *l. c.* 32. — Watson & Coulter, *l. c.*

Andromeda pulchella, Salisbury, *Prodr.* 289 (1796).

Lyonia Mariana, D. Don, *l. c.* (1834). — Don, *l. c.*

Leucothoe Mariana, De Candolle, *Prodr.* vii. 602 (1839).

[13] Among the fungi found on the American species of Andromeda the most conspicuous is the remarkable *Exobasidium Andromedæ*, Peck, which appears in the form of irregular bag-like bodies, often several inches in length, hanging in early summer from the branches of *Andromeda ligustrina*, Elliott.

[14] Linnæus, *Fl. Lapp.* 126.

ANDROMEDA FERRUGINEA.

FLOWERS in axillary clusters; corolla globose; anthers destitute of appendages. Capsule 5-angled and ridged, the ridges separable in dehiscence. Leaves coriaceous, persistent, like the young branches lepidote-scurfy.

Andromeda ferruginea, Walter, *Fl. Car.* 138 (1788). — Willdenow, *Spec.* ii. 609. — *Nouveau Duhamel*, i. 190. — Ventenat, *Hort. Malm.* 80, t. 80. — Persoon, *Syn.* i. 480. — Du Mont de Courset, *Bot. Cult.* ed. 2, iii. 496. — Desfontaines, *Hist. Arb.* i. 257. — Pursh, *Fl. Am. Sept.* i. 292. — Elliott, *Sk.* i. 489. — Chapman, *Fl.* 263. — Gray, *Syn. Fl. N. Am.* ii. 33. — Sargent, *Forest Trees N. Am. 10th Census U. S.* ix. 96.

Lyonia ferruginea, Nuttall, *Gen.* i. 266 (1818). — Don, *Gen. Syst.* iii. 830. — Dietrich, *Syn.* ii. 1399. — De Candolle, *Prodr.* vii. 600. — Koch, *Dendr.* ii. 122. — Lauche, *Deutsche Dendr.* ed. 2, 229.

A tree, occasionally twenty to thirty feet in height, with a slender crooked or often prostrate trunk rarely ten inches in diameter, and thin rigid divergent branches which form a tall oblong irregular head; or often a shrub two or three feet high. The bark of the trunk, which varies from an eighth to a quarter of an inch in thickness, is divided into long narrow ridges by shallow longitudinal furrows, and is reddish brown on the surface, which separates into short thick scales. The branchlets, when they first appear, are thickly coated with minute ferrugineous scales, and in their second year are covered with glabrous or pubescent light or dark red-brown bark, which is smooth or exfoliates in small thin scales. The leaves are cuneate-obovate, rhombic-obovate, or cuneate-oblong, acute or rounded at the apex, and usually tipped with a cartilaginous mucro, gradually wedge-shaped at the base, and entire, with thickened revolute margins; when they unfold they are scurfy on both surfaces, but especially on the lower, and at maturity are thick and firm, pale green, smooth and shining or sometimes obscurely lepidote above, covered below with ferrugineous or pale scales, one to three inches long and a quarter of an inch to an inch and a half broad, with midribs and primary veins prominent on the upper as well as on the lower surface, and broad conspicuous reticulate veinlets; they are borne on short thick petioles much enlarged at the base, and, appearing in early spring, do not fall before the summer or autumn of their second year. The flowers are chiefly produced on the branches of the year or occasionally on those of the previous year, and open from February until April, when the leaves are fully grown; they are borne in crowded axillary short-stemmed or sessile ferrugineous-lepidote fascicles, on slender recurved pedicels much shorter than the leaves, and are an eighth of an inch in diameter. The bracts and bractlets are minute, acute, and early deciduous. The calyx, which is covered on the outer surface with ferrugineous scales, is five-lobed, with acute lobes, and is a third as long as the globular white pubescent corolla, which is five-toothed, with short reflexed acute teeth slightly thickened and ciliate on the margins. The pubescent filaments are shortened by a conspicuous geniculate fold in the middle, and, like the short anthers attached just above the middle, are destitute of appendages. The ovary is coated with thick white tomentum; and the stout style, which is as long as the corolla or a little longer, is glabrous. The fruit is borne on a stout erect stem, and is an oblong five-angled capsule a quarter of an inch in length, with thickened ribs at the dorsal sutures, which separate from the valves when the capsule opens. From the placentas, borne at the apex of the columella or axis, a number of seeds are suspended; these are minute, narrow-oblong, and are covered with a loose cellular-reticulate coat produced at both ends into short fringe-like wings.

Andromeda ferruginea is distributed from the coast region of South Carolina to Cedar Keys on the west coast of Florida. It is said to inhabit the West Indies and Mexico, where it is reported from the region of San Luis Potosí as growing at elevations of from six to eight thousand feet above

the sea, from the mountains of Oaxaca, and from Orizaba, Jitotole, and Talea.[1] In the United States it is usually found in the neighborhood of the coast, where, in the rich soil of the wooded hummocks which rise from the sandy Pine-covered coast plain, it grows as a small tree,[2] with crowded narrow less conspicuously reticulate-veined leaves, or in the dry sandy sterile soil of the Pine barrens as a low shrub[3] with remoter broader obovate or rhomboidal leaves conspicuously reticulate-veined.

The wood of *Andromeda ferruginea* is heavy, hard, and close-grained, although not strong, with a satiny surface susceptible of receiving a beautiful polish; it contains numerous thin medullary rays, and is light brown tinged with red, with thick lighter colored sapwood. The specific gravity of the absolutely dry wood is 0.7500, a cubic foot weighing 46.74 pounds.

First described by Walter in 1788, *Andromeda ferruginea* had been introduced twelve years earlier by the nurseryman James Gordon into English gardens,[4] from which it no doubt disappeared long ago; and this handsome plant, which covers itself every year with countless flowers, is now probably unknown in pleasure-grounds, which it would adorn at all seasons of the year.

[1] Hemsley, *Bot. Biol. Am. Cent.* ii. 282.

[2] *Andromeda ferruginea*, var. *arborescens*, Michaux, *Fl. Bor.-Am.* i. 252 (1803).

Andromeda rigida, Pursh, *Fl. Am. Sept.* i. 292 (1814). — Loddiges, *Bot. Cab.* ii. t. 430.

Lyonia rigida, Nuttall, *Gen.* i. 266 (1818). — Don, *Gen. Syst.* iii. 830. — De Candolle, *Prodr.* vii. 600.

[3] *Andromeda rhomboidalis*, *Nouveau Duhamel*, i. 192 (1801).
Andromeda ferruginea, var. *fruticosa*, Michaux, *l. c.* (1803).
Lyonia? rhomboidalis, Don, *l. c.* 831 (1834).

[4] Aiton, *Hort. Kew.* ii. 68. — Loudon, *Arb. Brit.* ii. 1109 (Lyonia).

EXPLANATION OF THE PLATE.

Plate CCXXXIV. Andromeda ferruginea.

1. A flowering branch, natural size.
2. Diagram of a flower.
3. A flower, enlarged.
4. Rear view of a flower, enlarged.
5. Vertical section of a flower, enlarged.
6. A flower, the corolla removed, enlarged.
7. A stamen, enlarged.
8. Cross section of an ovary, enlarged.
9. An ovule, much magnified.
10. A fruiting branch, natural size.
11. A fruit, enlarged.
12. A fruit after the opening of the valves, enlarged.
13. A fruit, two of the valves removed, enlarged.
14. A seed, enlarged.
15. Vertical section of a seed, enlarged.
16. An embryo, much magnified.

C. E. Faxon del. Rapine sc

ANDROMEDA FERRUGINEA, Walt.

A. Riocreux direx.t Imp. R Taneur, Paris

OXYDENDRUM.

FLOWERS perfect; calyx free, 5-parted, the divisions valvate in æstivation; corolla gamopetalous, 5-lobed, the lobes imbricated in æstivation; stamens 10; ovary superior, 5-celled; ovules numerous, ascending. Fruit a 5-celled many-seeded capsule. Leaves alternate, membranaceous, deciduous, destitute of stipules.

Oxydendrum, De Candolle, *Prodr.* vii. 601 (1839). — Meisner, *Gen.* pt. ii. 153. — Endlicher, *Gen.* Suppl. i. 1412. — Bentham & Hooker, *Gen.* ii. 585. — Baillon, *Hist. Pl.* xi. 180.

Andromeda, Linnæus, *Gen.* 123 (1737) (in part). — A. L. de Jussieu, *Gen.* 160 (in part).

A tree, with thick deeply furrowed bark, slender terete glabrous light red or brown branchlets marked by elevated nearly triangular leaf-scars displaying a lunate row of crowded fibro-vascular bundle-scars and many elevated oblong dark lenticels, acid foliage, and fibrous roots. Winter-buds axillary, minute, partly immersed in the bark, obtuse, covered with opposite broadly ovate dark red scales rounded at the apex, those of the inner ranks accrescent.[1] Leaves alternate, revolute in vernation, oblong or lanceolate, acute, gradually contracted at the base into long slender petioles, serrate with minute incurved callous teeth, penniveined, with conspicuous bright yellow midribs and reticulate veinlets, thin and firm, dark green and lustrous on the upper surface, pale and glaucous on the lower, glabrous, or at first slightly puberulous, deciduous. Flowers in puberulous panicles of secund racemes appearing in summer and terminal on axillary leafy shoots of the year, the lower racemes from the axils of the upper leaves. Pedicels produced from the axils of lanceolate-acute caducous bracts, clavate, erect, coated with hoary pubescence, and bibracteate above the middle, the bractlets linear-acute, caducous. Flower-buds ovate-acute, puberulous. Calyx free, divided nearly to the base, pubescent or puberulous on the outer surface, persistent, the divisions ovate-lanceolate and acute. Corolla hypogynous, cylindrical to ovate-conical, white, puberulous, the lobes minute, ovate-acute, reflexed. Stamens ten, included; filaments subulate, broad, pilose, inserted on the very base of the corolla; anthers linear-oblong, narrower than the filaments, attached on the back above the base, introrse, two-celled, the cells opening longitudinally from the apex to the middle; pollen grains compound. Disk thin, obscurely ten-lobed. Ovary broadly ovoid, pubescent, five-celled; style columnar, thick, exserted, crowned with a simple stigma; ovules numerous in each cell, attached to an axile placenta rising from the base of the cell, ascending, amphitropous; raphe ventral; micropyle superior. Capsule small, ovoid-pyramidal, crowned with the remnants of the persistent style, five-lobed, puberulous, loculicidally five-valved, the valves ligneous, septiferous, separating from the central persistent placentiferous axis, many-seeded. Seeds ascending, elongated; testa membranaceous, loose, reticulated, produced at both ends into long slender points. Embryo minute, axile in fleshy albumen, cylindrical; radicle terete, next the hilum.

The wood of Oxydendrum is heavy, hard, and very close-grained, with a satiny surface susceptible of receiving a beautiful polish; it contains numerous medullary rays, and is brown tinged with red, with lighter colored sapwood composed of eighty or ninety layers of annual growth. The specific gravity of the absolutely dry wood is 0.7458, a cubic foot weighing 46.48 pounds. It is sometimes used locally for the handles of tools and the bearings of machinery.[2]

[1] Oxydendrum does not appear to form a terminal bud, the apex of the branchlet appearing as a minute black point close to the upper axillary bud, which the following year prolongs the branch.

[2] Oxydendrum increases its trunk-diameter slowly. The log-specimen, from the mountains of Tennessee, in the Jesup Collection of North American Woods in the American Museum of Natural History in New York, is eleven inches in diameter inside the bark, and shows eighty-six layers of annual growth.

The leaves of Oxydendrum have a pleasant acidulous taste, and when chewed allay thirst; they are reputed to be tonic, refrigerant, and diuretic, and are occasionally used in domestic practice in infusions and decoctions for the treatment of fevers.[1]

The earliest account of Oxydendrum was published in 1739 by Gronovius in the *Flora Virginica* of Clayton, where it is described as an Andromeda.[2]

The generic name, from ὀξύς and δένδρον, alludes to the acid leaves. The genus consists of a single species.

[1] Rafinesque, *Med. Fl.* i. 41, t. 5. — Porcher, *Resources of Southern Fields and Forests*, 379. — Rosenthal, *Syn. Pl. Diaphor.* 516. — Johnson, *Man. Med. Bot. N. Am.* 194.

[2] *Andromeda arborea foliis oblongo-ovatis integerrimis, floribus paniculatis nutantibus, racemis simplicissimis*, 48.

Frutex foliis oblongis acuminatis, floribus spicatis unoversu dispositis, Catesby, *Nat. Hist. Car.* i. 71, t. 71.

OXYDENDRUM ARBOREUM.

Sorrel Tree. Sour Wood.

Oxydendrum arboreum, De Candolle, *Prodr.* vii. 601 (1839). — Dietrich, *Syn.* ii. 1389. — Chapman, *Fl.* 263. — Curtis, *Rep. Geolog. Surv. N. Car.* 1860, iii. 79. — Koch, *Dendr.* ii. 128. — Gray, *Syn. Fl. N. Am.* ii. 33. — Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix. 98. — Watson & Coulter, *Gray's Man.* ed. 6, 317.

Andromeda arborea, Linnæus, *Spec.* 394 (1753). — Miller, *Dict.* ed. 8, No. 4. — Lamarck, *Dict.* i. 158. — Marshall, *Arbust. Am.* 7. — Castiglioni, *Viag. negli Stati Uniti*, ii. 191. — Wangenheim, *Nordam. Holz.* 105. — Walter, *Fl. Car.* 138. — Willdenow, *Spec.* ii. 612; *Enum.* 452; *Berl. Baumz.* ed. 2, 31. — Michaux, *Fl. Bor.-Am.* i. 255. — *Nouveau Duhamel*, i. 178. — *Bot. Mag.* xxiii. t. 905. — Desfontaines, *Hist. Arb.* i. 257. — Du Mont de Courset, *Bot. Cult.* ed. 2, iii. 495. — Michaux f. *Hist. Arb. Am.* iii. 222, t. 7. — Pursh, *Fl. Am. Sept.* i. 295. — Nuttall, *Gen.* i. 265. — Elliott, *Sk.* i. 491. — Mordant de Launay, *Herb. Amat.* v. t. 342. — W. P. C. Barton, *Fl. N. Am.* i. 105, t. 30. — Hayne, *Dendr. Fl.* 59. — Sprengel, *Syst.* ii. 291. — Gray, *Man.* 266.

Andromeda arborescens, Persoon, *Syn.* i. 480 (1805). — Loddiges, *Bot. Cab.* xiii. t. 1210.

Lyonia arborea, D. Don, *Edinburgh New Phil. Jour.* xvii. 159 (1834). — Don, *Gen. Syst.* iii. 831. — Spach, *Hist. Vég.* ix. 486.

A tree, occasionally fifty or sixty feet in height, with a tall straight trunk twelve to twenty inches in diameter, and slender spreading branches which form a narrow oblong round-topped head. The bark of the trunk is two thirds of an inch to an inch in thickness, gray tinged with red, and divided by deep longitudinal furrows into broad rounded ridges covered with small thick appressed scales. The branchlets, when they first appear, are glabrous, light yellow-green, and marked with orange-colored lenticels, and in their first winter are orange-colored to reddish brown. The inner bud-scales at maturity are an inch long, an eighth of an inch wide, spatulate, acute at the apex, and slightly puberulous on the inner surface and the margins. The leaves, when they unfold, are bronze-green, very lustrous, and glabrous with the exception of a slight pubescence on the upper side of the midribs and of a few scattered hairs on the under side of the midribs and on the petioles; at maturity they are five to seven inches in length, an inch and a half to two inches and a half in breadth, and are borne on petioles two thirds of an inch long. In the autumn before falling they turn bright scarlet. The flower-clusters appear on the ends of the leafy shoots of the year late in June or early in July, and the flowers, which are a third of an inch in length and arranged in lax drooping panicles seven or eight inches long, open three or four weeks later. The fruit, which hangs in drooping clusters sometimes a foot in length, ripens in September, although the empty capsules often remain on the branches until late in the autumn.

Oxydendrum arboreum is distributed from Mount Pleasant, Westmoreland County, Pennsylvania, to southern Indiana and middle Tennessee, and southward along the Alleghany Mountains to western Florida and the eastern shores of Mobile Bay, and through the elevated regions of the Gulf states to western Louisiana. It is usually found in well-drained gravelly soil on ridges rising above the banks of rivers in forests of White Oaks, Hickories, Tupelos, Walnuts, and Sugar Maples, and attains its largest size on the western slopes of the Big Smoky Mountains in Tennessee.

According to Aiton, the Sorrel-tree was cultivated in England by Philip Miller as early as 1752.[1] Among the small trees of North America few are more beautiful or better deserve the attention of planters. The handsome lustrous leaves are not injured by insects or fungal diseases; the large drooping clusters of white flowers appear at a season when few other trees are in bloom; and the color of the foliage in autumn is not surpassed in brilliancy and splendor by that assumed by any other tree.

[1] Aiton, *Hort. Kew.* ii. 69. — Loudon, *Arb. Brit.* ii. 1111 (Lyonia).

The Sorrel-tree is easily raised from seeds, which germinate readily, although the seedlings grow slowly; it is transplanted without difficulty, and is perfectly hardy as far north as eastern New England and in western and central Europe.

EXPLANATION OF THE PLATE.

PLATE CCXXXV. OXYDENDRUM ARBOREUM.

1. A flowering branch, natural size.
2. Diagram of a flower.
3. A flower, enlarged.
4. Vertical section of a flower, enlarged.
5. A stamen, front and rear views, enlarged.
6. A flower, the corolla removed, enlarged.
7. An ovule, much magnified.
8. A portion of a fruit-cluster, natural size.
9. Cross section of a fruit, enlarged.
10. Vertical section of a fruit, enlarged.
11. A seed, enlarged.
12. Vertical section of a seed, enlarged.
13. An ovule, much magnified.
14. A winter branchlet, natural size.

C.E. Faxon del.

Muzelle sc.

OXYDENDRUM ARBOREUM, DC

A. Riocreux direx.t

Imp. R. Taneur, Paris.

KALMIA.

FLOWERS perfect; calyx 5-lobed, the lobes imbricated in æstivation; corolla gamopetalous, 10-pouched below the 5-lobed limb, the lobes imbricated in æstivation; stamens 10; anthers held before anthesis in the pouches of the corolla; ovary superior, 5-celled; ovules numerous. Fruit a septicidal woody capsule. Leaves opposite, alternate, or 3-verticillate, coriaceous, persistent, destitute of stipules.

Kalmia, Linnæus, *Amœn.* iii. 13 (1756); *Gen.* ed. 6, 217. — A. L. de Jussieu, *Gen.* 158. — Endlicher, *Gen.* 759. — Meisner, *Gen.* 246. — Bentham & Hooker, *Gen.* ii. 596. — Baillon, *Hist. Pl.* xi. 172.

Rhododendros, Adanson, *Fam. Pl.* ii. 164 (in part) (1763).

Small trees or shrubs, with scaly bark, terete or two-edged branchlets, minute axillary leaf-buds, elongated inflorescence-buds of imbricated scales, and fibrous roots. Leaves opposite, alternate, or rarely in whorls of three, ovate-oblong or linear, short-petiolate, entire, coriaceous, persistent. Flowers in simple or clustered axillary umbels, fascicles, or corymbs, or rarely axillary, solitary, and scattered. Pedicels slender, bibracteolate at the base, produced from the axils of foliaceous coriaceous ovate or subulate persistent bracts. Calyx five-parted, the divisions small, or large and foliaceous, persistent or deciduous. Corolla rose-colored, purple, or white, crateriform or saucer-shaped, the tube short, with ten pouches just below the five-parted limb, the lobes ovate, acute; before anthesis prominently ten-ribbed from the pouches to the acute apex of the bud, the salient keels of the ribs running to the points of the lobes and to the sinuses. Stamens ten, hypogynous, shorter than the corolla; filaments filiform; anthers oblong, attached on the back, two-celled, each cell opening by a short apical oblong longitudinal pore, at first free in the bud, the filaments then erect, later received in the pouches of the corolla and afterwards bent back by its enlargement and expansion and straightening elastically and incurving on the release of the anthers; pollen grain compound, discharged by the straightening of the filaments.[1] Disk prominent, ten-lobed. Ovary subglobose, five-celled; style filiform, exserted, persistent or deciduous, crowned with a capitate stigma; ovules numerous in each cell, inserted on a two-lipped placenta pendulous or porrect from near the top of the thin columella, few-ranked, anatropous; raphe ventral; micropyle superior. Capsules many-seeded, globose, slightly five-lobed, five-celled, tardily septicidally five-valved, the valves crustaceous, ultimately opening down the middle by a narrow slit, and separating from the persistent placenta-bearing axis. Seed oblong or subglobose; testa crustaceous or membranaceous; albumen fleshy. Embryo minute, terete, near the hilum; radicle erect, rather shorter than the oblong cotyledons.

Kalmia, of which six species are distinguished,[2] is North American and Cuban. One species, *Kalmia polifolia*,[3] inhabits bogs from Newfoundland and Hudson's Bay to the mountains of Pennsyl-

[1] The peculiar structure of the flowers of Kalmia makes their self-fertilization difficult, as the anthers are not naturally released from the corolla-sacks until the elasticity of the filaments is lost, and evidently provides for their cross-fertilization through the agency of humble-bees, who, in searching in the cup of the flower for honey, free the anthers, and receiving the pollen on their abdomens spread it on the stigma of the next flower which they visit (Beal, *Am. Nat.* i. 257. — Gray, *How Plants Behave*, 33, f. 26–29; *American Agriculturist*, xxxv. 262, f. 1–4; *Botanical Text-Book*, ed. 6, 229, f. 455–458).

[2] Gray, *Syn. Fl. N. Am.* ii. 37.

[3] Wangenheim, *Schrift. Gesell. Nat. Fr. Berlin*, viii. 130, t. 5 (1788).

Kalmia glauca, Aiton, *Hort. Kew.* ii. 64, t. 8 (1789). — *Bot. Mag.* v. 177. — *Nouveau Duhamel*, i. 213, t. 45. — Guimpel, Otto & Hayne, *Abbild. Holz.* 165, t. 139. — De Candolle, *Prodr.* vii. 729. — Hooker, *Fl. Bor.-Am.* ii. 41. — Gray, *l. c.* 38. — Watson & Coulter, *Gray's Man.* ed. 6, 319.

vania, and in an alpine form ranges from Sitka to the high mountains of California and Colorado. Two species, one of which under favorable conditions occasionally becomes a small tree, are widely distributed through the eastern part of North America; two are confined to the coast region of the southern Atlantic states, and one with rigid heath-like leaves, *Kalmia ericoides*,[1] has been seen only in Cuba.

Kalmia has few useful properties. The leaves of *Kalmia latifolia* and of *Kalmia angustifolia*[2] are usually believed to be poisonous to animals, and cases of men poisoned by eating the flesh of birds which have fed upon the buds and leaves are reported.[3] The poisonous properties of Kalmia, however, are probably much exaggerated by popular fancy, and need scientific demonstration. Kalmia is slightly astringent, sedative, and antisyphilitic, and is occasionally used in medicine,[4] although its value is doubted by many physicians.[5] All the species bear handsome and interesting flowers, and those which inhabit the north are much cultivated. Where they can be successfully grown no other shrubs surpass these in value or beauty as garden plants.

The generic name commemorates the scientific labors of the Swedish traveler and botanist, Peter Kalm,[6] a friend and pupil of Linnæus, who traveled in eastern North America in the middle of the last century.

[1] Grisebach, *Cat. Pl. Cub.* 51 (1866).

[2] Linnæus, *Spec.* 391 (1753). — *Bot. Mag.* x. t. 331. — Guimpel, Otto & Hayne, *Abbild. Holz.* 164, t. 138. — De Candolle, *Prodr.* vii. 729. — Gray, *Syn. Fl. N. Am.* ii. 37. — Watson & Coulter, *Gray's Man.* ed. 6, 319.

[3] Kalm, *Travels*, English ed. i. 337. — Bigelow, *Med. Bot.* i. 133, t. 13. — Porcher, *Resources of Southern Fields and Forests*, 381–383.

[4] G. G. Thomas, *Inaug. Diss.* — B. S. Barton, *Coll.* ed. 2, i. 18, 48; ii. 26. — Rafinesque, *Med. Fl.* ii. 18. — *Boston Med. and Surg. Jour.* x. 213. — Griffith, *Med. Bot.* 428, f. 192. — *U. S. Dispens.* ed. 16, 1834.

[5] Johnson, *Man. Med. Bot. N. Am.* 194.

[6] See ii. 86.

KALMIA LATIFOLIA.

Laurel. Mountain Laurel.

FLOWERS in clustered panicles in the axils of upper leaves. Capsules depressed, glandular-viscid.

Kalmia latifolia, Linnæus, *Spec.* 391 (1753). — *Bot. Mag.* v. 175. — Wangenheim, *Beschreib. Nordam. Holz.* 105; *Nordam. Holz.* 64, t. 24, f. 50. — Marshall, *Arbust. Am.* 72. — Castiglioni, *Viag. negli Stati Uniti*, ii. 270. — Lamarck, *Dict.* iii. 345; *Ill.* ii. 487, t. 363, f. 1. — Gærtner, *Fruct.* i. 305, t. 63, f. 7. — Walter, *Fl. Car.* 138. — Abbot, *Insects of Georgia*, i. t. 37. — Willdenow, *Berl. Baumz.* 161; *Spec.* ii. 600; *Enum.* 450. — Schkuhr, *Handb.* i. 359, t. 116. — Schmidt, *Oestr. Baumz.* iii. 42, t. 166. — *Nouveau Duhamel*, i. 210, t. 44. — Michaux, *Fl. Bor.-Am.* i. 258. — Persoon, *Syn.* i. 477. — Thornton, *Sex. Syst. Linn.* t. — Desfontaines, *Hist. Arb.* i. 220. — Du Mont de Courset, *Bot. Cult.* ed. 2, iii. 322. — Michaux f. *Hist. Arb. Am.* iii. 147, t. 5. — Pursh, *Fl. Am. Sept.* i. 296. — Bigelow, *Fl. Boston.* 103. — Nuttall, *Gen.* i. 267. — Hayne, *Dendr. Fl.* 54. — Elliott, *Sk.* i. 481. — Guimpel, Otto & Hayne, *Abbild. Holz.* 162, t. 137. — Sprengel, *Syst.* ii. 293. — Audubon, *Birds*, t. 55. — *Sertum Botanicum*, iv. t. — Mordant de Launay, *Herb. Amat.* iii. t. 151. — Don, *Gen. Syst.* iii. 850. — De Candolle, *Prodr.* vii. 729. — Spach, *Hist. Vég.* ix. 498, t. 139. — Hooker, *Fl. Bor.-Am.* ii. 41. — Dietrich, *Syn.* ii. 1407. — Torrey, *Fl. N. Y.* i. 440. — Darlington, *Fl. Cestr.* ed. 3, 172. — Chapman, *Fl.* 264. — Curtis, *Rep. Geolog. Surv. N. Car.* 1860, iii. 99. — Koch, *Dendr.* ii. 152. — Emerson, *Trees Mass.* ed. 2, ii. 443, t. — Lauche, *Deutsche Dendr.* ed. 2, 250, f. 100. — *The Garden*, xxii. 6, t. 343. — Gray, *Syn. Fl. N. Am.* ii. 38. — Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix. 98. — Watson & Coulter, *Gray's Man.* ed. 6, 319.

A tree, rarely thirty to forty feet in height, with a short crooked contorted trunk sometimes eighteen or twenty inches in diameter, and stout forked divergent branches which form a round-topped compact head; or more often a dense broad shrub six to ten feet high, sending up from the ground numerous crooked branches. The bark of the trunk, which is hardly more than a sixteenth of an inch thick, is dark brown tinged with red, and is divided by longitudinal furrows into narrow ridges which separate into long narrow scales. The branches, when they first appear, are light green tinged with red, and are covered with soft white glandular-viscid hairs; they soon become glabrous, and in their first winter are green tinged with red and very lustrous, turning bright red-brown during their second year, and paler during the following season, when the bark begins to separate in large thin papery scales, exposing the cinnamon-red inner bark, and the branches are marked with large deeply depressed leaf-scars showing near the centre a crowded cluster of fibro-vascular bundle-scars. The young shoots begin to grow in early spring from buds formed before midsummer in the previous year in the axils of the leaves just below those from which the clusters of flower-buds are produced, and in which they are almost completely immersed; the tip of the branch dies when these axillary buds, two of which usually produce branches, are formed, and appears during the summer as a small black point between the last pair of leaves. The inner bud-scales are accrescent at maturity, often an inch long and half an inch wide, and are ovate, acute, light green, and covered with glandular white hairs, and in falling mark the base of the shoots with conspicuous broad scars. The leaves are alternate or sometimes in pairs or in threes, conduplicate in vernation, each leaf in the bud being inclosed by the one immediately below it, oblong or elliptical-lanceolate, acute, or rounded and tipped at the apex with callous points, and gradually narrowed at the base; when they unfold they are slightly tinged with pink and are covered with glandular white hairs, and at maturity they are thick and rigid, dark and rather dull green above, lighter and yellow-green below, three to four inches long and an inch to an inch and a half wide, with broad yellow midribs rounded on both sides, and obscure immersed veins not distinguishable on the lower surface; they are borne on stout terete or slighty flattened petioles two thirds of an inch in length, and begin to fall during their second summer. The inflorescence-buds appear in the autumn

in the axils of the upper leaves in the form of slender acuminate cones of acute pubescent scales; they begin to lengthen with the first warm days of spring, and usually develop two or several lateral branches, the whole forming a compound many-flowered corymb of numerous crowded fascicles, more or less covered with dark scurfy scales, four or five inches in diameter, and overtopped at the flowering time by the leafy branches of the year. The branches of the fascicles, and the long slender pedicels, which are red or green, covered with glandular hairs, and furnished at the base with two minute acute bractlets, are developed from the axils of acute persistent bracts sometimes a third of an inch long. The flowers open in May or June, and when fully expanded are nearly an inch in diameter. The calyx is divided nearly to the base into narrow acute thin green lobes. The corolla is white, rose-colored, or pink, viscid-pubescent, and marked on the inner surface with a waving dark rose-colored line and with delicate purple penciling above the sacs. The fruit, which ripens in September, is depressed, crowned with the persistent style, surrounded at the base by the persistent calyx, three sixteenths of an inch in diameter, and covered with viscid hairs. The seeds, which are oblong, are scattered by the opening of the valves of the capsules, which remain on the branches until the following year, the valves splitting through the middle and generally carrying the placentas with them.

Kalmia latifolia is distributed from New Brunswick to the northern shores of Lake Erie,[1] and southward, generally in the neighborhood of the Appalachian Mountains, to western Florida, and through the Gulf states to western Louisiana and the valley of the Red River in Arkansas. At the north it often grows in low moist ground near the margins of swamps, or on dry slopes under the shade of the deciduous-leaved forest; on the southern mountains, where it is most abundant and often forms great dense impenetrable thickets, and where it ascends to elevations of three to four thousand feet above the level of the sea, it selects as its home rich rocky hillsides. It is usually a shrub, and assumes the habit and attains the size of a tree only in a few secluded fertile valleys between the Blue Ridge and the Alleghany Mountains in North and South Carolina.

The wood of *Kalmia latifolia* is heavy, hard, strong although rather brittle, and close-grained; it contains remote broad dark brown conspicuous medullary rays, and between these, numerous thin inconspicuous rays. It is brown tinged with red, with slightly lighter colored thick sapwood. The specific gravity of the absolutely dry wood is 0.7160, a cubic foot weighing 44.62 pounds. It is used for the handles of tools, in turnery, and for fuel.

The earliest account of *Kalmia latifolia* appeared in 1700 in the *Almagesti Botanici Mantissa* of Plukenet.[2] According to Aiton,[3] it was introduced into English gardens in 1734 by Peter Collinson.[4]

When it is covered with its clusters of delicately marked white or pink flowers, the Mountain Laurel[5] is one of the most beautiful plants of the North American flora. Few shrubs are more desirable or satisfactory inhabitants of the garden, which it ornaments at all seasons of the year. It is easily raised from seed; the fine matted roots, which form a compact solid ball, make the operation of moving the young plants easy and safe; it flowers profusely when only a few inches in height; it is perfectly hardy except in countries of the most extreme winter cold or of tropical heat, and it is not particular about soil or exposure, although, like other plants of its family, it does not flourish in soil strongly impregnated with lime.[6]

[1] Brunet, *Cat. Vég. Lig. Can.* 39. — Macoun, *Cat. Can. Pl.* i. 300.

[2] *Cistus Chamærhododendros Mariana, Laurifolia, floribus expansis, summo ramulo in umbellam plurimis*, 49; *Amalth. Bot.* t. 379, f. 6.

Chamædaphne foliis Tini, floribus bullatis umbellatis, Catesby, *Nat. Hist. Car.* ii. 98, t. 98.

Andromeda foliis ovatis obtusis, corollis corymbosis infundibuliformibus, genitalibus declinatis, Clayton, *Fl. Virgin.* 160.

Ledum floribus bullatis confertim in summis caulibus nascentibus, foliis ex oblongo lanceolatis integerrimis glabris, Trew, *Pl. Ehret*, t. 38, f. 1.

[3] *Hort. Kew.* ii. 64. — Loudon, *Arb. Brit.* ii. 1151, f. 959.

[4] See i. 8.

[5] *Kalmia latifolia* is also sometimes called Calico Bush, Spoon Wood, and universally by the inhabitants of the southern Alleghany Mountains, Ivy.

[6] A curious monstrous form of *Kalmia latifolia*, in which the corollas are all deeply divided into five narrowly linear or sometimes nearly thread-shaped petals, the pouches being rudimentary and represented by slight depressions on the inner surface of the divisions of the corolla, was discovered several years ago by Miss M. Bryant near Deerfield, Massachusetts (Gray, *Am. Nat.* iv. 373. — Sargent, *Garden and Forest*, iii. 452, f. 56).

EXPLANATION OF THE PLATES.

Plate CCXXXVI. Kalmia latifolia.

1. A flowering branch, natural size.
2. Diagram of a flower.
3. Vertical section of a flower, enlarged.
4. Front and rear views of a stamen, enlarged.
5. Vertical section of a flower, the corolla removed, enlarged.
6. Cross section of an ovary, enlarged.
7. An ovule, much magnified.

Plate CCXXXVII. Kalmia latifolia.

1. A fruiting branch, natural size.
2. A fruit, enlarged.
3. Vertical section of a fruit, enlarged.
4. Cross section of a fruit, enlarged.
5. A seed, enlarged.
6. Vertical section of a seed, enlarged.
7. An embryo, much magnified.
8. A cluster of inflorescence-buds in autumn, enlarged.
9. An inflorescence-bud in early spring, natural size.
10. The end of a sterile shoot in winter, one of the leaves removed, showing the axillary leaf-buds.

C.E.Faxon del.

Picart sc.

KALMIA LATIFOLIA, L.

A.Riocreux direx.t

Imp.R Taneur, Paris.

C.E. Faxon del. *Rapine sc.*

KALMIA LATIFOLIA, L.

A. Riocreux direx.t *Imp. R. Taneur, Paris.*

RHODODENDRON.

FLOWERS perfect; calyx 5-parted or toothed, the divisions imbricated in æstivation, often much reduced or obsolete; corolla gamopetalous, usually 5-lobed, the lobes imbricated in æstivation; stamens usually 8 to 10; ovary superior, 5 to 20-celled; ovules numerous in each cell. Fruit a woody 5 to 20-celled septicidal many-seeded capsule. Leaves alternate, entire, coriaceous or membranaceous, persistent or deciduous, destitute of stipules.

Rhododendron, Maximowicz, *Mém. Acad. Sci. St. Pétersbourg*, sér. 7, xvi. 13 (*Rhododendreæ Asiæ Orientalis*) (1870). — Bentham & Hooker, *Gen.* ii. 599. — Baillon, *Hist. Pl.* xi. 171.

Azalea, Linnæus, *Gen.* 53 (1737). — A. L. de Jussieu, *Gen.* 158. — Endlicher, *Gen.* 758. — Meisner, *Gen.* 246.

Rhododendron, Linnæus, *Syst. Nat.* ed. 10, 1023 (1759); *Gen.* ed. 6, 218. — A. L. de Jussieu, *Gen.* 158. — Endlicher, *Gen.* 759. — Meisner, *Gen.* 246.

Rhodora, Linnæus, *Gen.* ed. 6, 218 (1764). — A. L. de Jussieu, *Gen.* 159. — Meisner, *Gen.* 246.

Rhododendron, D. Don, *Edinburgh New Phil. Jour.* vi. 49 (1822).

Vireya, Blume, *Bijdr. Fl. Ned. Ind.* 854 (not Rafinesque) (1826). — Don, *Gen. Syst*, iii. 848.

Anthodendron, Reichenbach, *Moessler Handb. Gewächsk.* ed. 2, i. 308 (1827). — Meisner, *Gen.* 246.

Rhododendron, Don, *Gen. Syst.* iii. 843 (1834).

Osmothamnus, De Candolle, *Prodr.* vii. 715 (1839). — Endlicher, *Gen.* Suppl. i. 1412.

Trees or shrubs, sometimes epiphytal, glabrous, pubescent, tomentose, or lepidote,[1] with scaly bark, hard close-grained wood, terete branchlets, scaly leaf-buds, and fibrous roots. Leaves alternate, usually clustered at the ends of the branches, entire, coriaceous or membranaceous, persistent or deciduous. Flowers in terminal few or many-flowered umbellate corymbs or fascicles from separate strobilaceous inflorescence-buds with usually numerous caducous bracts, or rarely axillary or solitary from leafy or separate buds, or terminal and solitary on leafy shoots of the year. Calyx five-parted or toothed, disk-shaped, cupular or obsolete, coriaceous or foliaceous, persistent. Corolla usually funnel-shaped or campanulate, rarely tubular, salver-formed or subrotate, the limb more or less oblique, five or rarely six to ten-lobed or parted, occasionally two-lipped, deciduous. Stamens hypogynous, usually eight to ten, rarely five, or twelve to eighteen, more or less unequal, often declinate, ultimately spreading; filaments usually subulate-filiform or rarely short and thick, usually pilose or bearded at the base; anthers attached on the back, stout or elongated, rarely incurved and connivent, entire, two-celled, each cell opening by a terminal pore. Disk usually thick and fleshy, crenately lobed. Ovary superior, five to twenty-celled; style slender, short or elongated, declinate or incurved, crowned with a capitate five to twenty-lobed stigma; ovules numerous in each cell, attached in many series to an axile two-lipped placenta projected from the inner angle of the cell, anatropous; raphe ventral; micropyle superior. Capsule short or elongated, splitting septicidally from the apex into five to twenty valves free from the placentiferous axis, many-seeded. Seeds scobiform; testa loose, reticulate, produced beyond the nucleus at both ends into short often laciniate appendages. Embryo minute, cylindrical, axile in fleshy albumen; cotyledons oblong, shorter than the radicle turned towards the hilum.[2]

[1] The character of the covering of the leaves of Rhododendron has been found useful in grouping the species and for distinguishing them. (See Vesque, *Ann. Sci. Nat.* sér. 7, i. 238.)

[2] By Maximowicz (*Mém. Acad. Sci. St. Pétersbourg*, sér. 7, xvi. 14) (*Rhododendreæ Asiæ Orientalis*) Rhododendron is divided into the following sections: —

OSMOTHAMNUS. Flowers in many-flowered terminal clusters from separate subglobose leafless buds of few caducous bracts on shoots of the previous year; corolla campanulate or salver-form, the tube erect or slightly curved, villous in the throat; stamens 5 to 7, included; ovary 4 to 5-celled. Dwarf graveolent alpine shrubs with persistent leaves tomentose on the lower surface. Central Europe, central Asia, Siberia, and northern China.

EURHODODENDRON. Flowers in many-flowered terminal clusters

Nearly two hundred species of Rhododendron are already known;[1] they abound in western Thibet[2] and on the Himalayas[3] and their western prolongation in southwestern China;[4] through the Malay Peninsula and Archipelago,[5] where several species inhabit the high mountain forests, they range to New Guinea,[6] and through central and northern China and Corea[7] to Japan,[8] where a dozen species are found; of these, *Rhododendron Camtschaticum*[9] reaches Alaska[10] by the Kurile Islands.[11] Fifteen or sixteen species, representing seven of the nine sections into which the genus has been divided, inhabit North America,[12] where they are chiefly confined to northern regions and high mountain ranges, a larger number occurring in the eastern than in the western part of the continent. Only *Rhododendron Lapponicum*[13] crosses the continent, ranging from the shores of Norton Sound to Labrador and the alpine summits of the White Mountains in New England, and by way of Greenland reaching Europe and northern Asia. In the extreme western part of Europe two other species[14] are found, while a third[15] inhabits the high mountain ranges of the central regions of the continent. Five species are found in the Orient;[16] the genus reappears in Afghanistan with two endemic species,[17] and rapidly increases in the number of species from west to east on the Himalayas. Rhododendrons were common in the Arctic regions of both hemispheres during the tertiary period, and traces of several species are found

from separate cone-like buds of many caducous bracts on shoots of the previous year; corolla 5 to 10-lobed, glabrous or pilose in the throat; stamens 10 to 20. Trees or shrubs with persistent leaves. Eastern and Pacific North America, Europe, Asia Minor, Himalayas, China, and Japan.

AZALEA. Flowers in many-flowered terminal clusters from separate cone-like terminal buds of many caducous bracts on shoots of the previous year; corolla funnel-form or campanulate-rotate, the limb 4-lobed or parted, rarely bilobed; stamens 5 to 10, exserted. Shrubs with membranaceous or rarely coriaceous deciduous leaves. Eastern and western North America, Asia Minor, China, and Japan.

TSUSIA. Flowers terminal from leafy buds of few caducous scales on shoots of the previous year; corolla campanulate; stamens 5 to 10; ovary 5-celled. Glandular shrubs with deciduous or persistent leaves. China and Japan.

KEYSIA. Flowers fascicled from axillary buds; corolla tubular-cylindric, the lobes incurved; stamens 10; ovary 5-celled. A shrub with persistent leaves. Himalayas.

RHODORASTRUM. Flowers solitary from axillary buds; corolla campanulate; stamens 10. Shrubs with deciduous lepidote slightly coriaceous leaves. Northern Asia, Himalayas, and eastern Thibet.

AZALEASTRUM. Flowers axillary from the same bud as the leafy shoot or from separate 1 to 3-flowered buds; corolla rotate or subcampanulate; stamens 5 to 10. Shrubs with coriaceous or membranaceous deciduous leaves. Northwestern America, eastern Thibet, China, and Japan.

THERORHODION. Flowers in 1 or 2-flowered clusters from buds terminal on the leafy shoots of the year, their bracts persistent on the base of the branch during the season; corolla rotate, 5-lobed, divided on the anterior side to the base; stamens 10. Low shrubs with deciduous leaves. Northwestern America and northeastern Asia.

To these sections Franchet (*Bull. Soc. Bot. France*, xxxiii. 229) adds a ninth: —

CHONIASTRUM. Flowers in 1 or 2-flowered fascicles from axillary buds; corolla infundibular; stamens 13 to 14, exserted. Leaves persistent. Southwestern China and eastern Thibet.

[1] Although botanical travelers have as yet hardly penetrated that great central Asiatic region where the Himalayan system is prolonged to the west and northwest in high mountain ranges, they have recently made known a large number of previously undescribed Rhododendrons, transferring the headquarters of the genus, as represented by the greatest number of species, from Sikkim to Yun-nan; and a further examination of the forests which cover the mountains of western and southwestern China, eastern Thibet, and northern Burmah may be expected to yield large additions to the number of species.

[2] Franchet, *Pl. David.* ii. 83.

[3] Hooker f. *Rhododendrons of the Sikkim-Himalaya; Fl. Brit. Ind.* iii. 462.

[4] Franchet, *Bull. Soc. Bot. France*, xxxiii. 223.

[5] Miquel, *Fl. Ind. Bat.* ii. 1057.

[6] Beccari, *Malesia*, i. 199. — Warburg, *Engler Bot. Jahrb.* xvi. 24.

[7] Maximowicz, *Mém. Acad. Sci. St. Pétersbourg*, sér. 7, xvi. 13 (*Rhododendreæ Asiæ Orientalis*). — Forbes & Hemsley, *Jour. Linn. Soc.* xxvi. 19.

[8] Franchet & Savatier, *Enum. Pl. Jap.* i. 287.

[9] Pallas, *Fl. Ross.* i. 48, t. 23 (1784). — De Candolle, *Prodr.* vii. 726. — Hooker, *Fl. Bor.-Am.* ii. 43. — Ledebour, *Fl. Ross.* ii. 922. — Regel & Tilling, *Tent. Fl. Ajan.* 110. — F. Schmidt, *Mém. Acad. Sci. St. Pétersbourg*, sér. 7, xii. 157 (*Fl. Sachal.*). — Maximowicz, *l. c.* 47.

Rhodothamnus Kamtschaticus, Lindley, *Paxton Brit. Fl. Gard.* i. 113, t. 22 (1850).

[10] Gray, *Syn. Fl. N. Am.* ii. 40.

[11] Miyabe, *Mem. Bost. Soc. Nat. Hist.* iv. 247 (*Fl. Kurile Islands*).

[12] Gray, *l. c.* 39.

[13] Wahlenberg, *Fl. Lapp.* 104 (1812). — *Bot. Mag.* lviii. t. 3106. — Hooker, *l. c.* — De Candolle, *l. c.* 724. — Gray, *l. c.* 42. — Watson & Coulter, *Gray's Man.* ed. 6, 321.

Azalea Lapponica, Linnæus, *Spec.* 151 (1753). — *Fl. Dan.* vi. t. 966. — Pallas, *l. c.* ii. 52, t. 70, f. 1.

[14] Nyman, *Conspect. Fl. Europ.* 491. — Hooker f. *Bot. Mag.* cxvi. t. 7149.

[15] *Rhododendron ferrugineum*, Linnæus, *l. c.* 392 (1753). — Jacquin, *Fl. Austr.* iii. 31, t. 255. — Hayne, *Arzn.* x. 25, t. 25. — Guimpel, Willdenow & Hayne, *Abbild. Deutsche Holz.* i. 69, t. 52. — Nees von Esenbeck, *Pl. Med.* t. 217. — De Candolle, *l. c.* — Nyman, *l. c.* 492.

[16] Boissier, *Fl. Orient.* iii. 971. — Trautvetter, *Act. Hort. Petrop.* ix. 513. — *Gartenflora*, 1886, 377, t. 1226.

[17] Aitchison & Hemsley, *Jour. Linn. Soc.* xviii. 75.

in the miocene rocks of central Europe,[1] where the genus is now poorly represented by two species which have been able to retain here only an alpine foothold.

Rhododendron possesses bitter, astringent, and narcotic properties. A decoction of the leaves of *Rhododendron chrysanthum*[2] is employed in Siberia in the treatment of rheumatism and other affections of the joints and muscles,[3] and is now used in some European countries for the same purpose.[4] The buds of *Rhododendron ferrugineum* are used in northern Italy in the preparation of an anti-rheumatic liniment;[5] and in the United States a decoction of the leaves of *Rhododendron maximum* is occasionally used domestically for the same purpose. The flowers of *Rhododendron flavum*[6] are believed to be poisonous and to have caused the madness of Xenophon's Ten Thousand;[7] and in India honey made in the spring where Rhododendrons abound is believed to be dangerous.[8] The flowers of the Himalayan *Rhodondedron arboreum*,[9] which are said to be slightly intoxicating, are eaten fresh or made into a conserve,[10] but its flower-buds and young leaves are thought to be poisonous to cattle. In Sikkim goats and sheep die from the effects of browsing on the foliage of *Rhododendron cinnabarinum*,[11] and the smoke produced by its burning wood inflames the face and eyes. The leaves of *Rhododendron Afghanicum*[12] are injurious to browsing animals and are considered poisonous to the touch by the natives.[13] The dried leaves of *Rhododendron campanulatum*[14] are used in India as snuff,[15] and the leaves of *Rhododendron lepidotum*[16] and of *Rhododendron Anthopogon*[17] as stimulants.[18] In China the leaves of different species of Rhododendron are employed to adulterate tea.[19]

Rhododendron produces hard close-grained compact wood; in India that of *Rhododendron arboreum* is used in building, in turnery, and for fuel and charcoal;[20] and in Japan Rhododendron wood is manufactured into many small articles.

Many species of Rhododendrons are cultivated in gardens, and during the last fifty years great attention has been paid to improving them by selection and cross-breeding.[21] The natural species most

[1] Zittel, *Handb. Palæontolog.* ii. 728, f. 378.

[2] Pallas, *Reise*, iii. 369; Appx. 729, t. N. f. 1, 2 (1776); *Fl. Ross.* i. 44, t. 30. — Linnæus f. *Syst.* ed. 13, Suppl. 237. — Hayne, *Arzn.* x. 27, t. 27. — Guimpel, Otto & Hayne, *Abbild. Holz.* 148, t. 123. — Nees von Esenbeck, *Pl. Med.* t. 216. — De Candolle, *Prodr.* vii. 723. — Ledebour, *Fl. Ross.* ii. 920. — Turczaninow, *Fl. Baicalensi-Dahurica*, ii. pt. ii. 205. — Maximowicz, *Prim. Fl. Amur.* 189; *Mém. Acad. Sci. St. Pétersbourg*, sér. 7, xvi. 20 (*Rhododendreæ Asiæ Orientalis*). — Miyabe, *Mem. Bost. Soc. Nat. Hist.* iv. 247 (*Fl. Kurile Islands*).

Rhododendron aureum, Georgi, *Reise*, 214 (1775).

Rhododendron officinale, Salisbury, *Parad. Lond.* i. pt. ii. t. 80 (1806).

[3] Gmelin, *Fl. Sibir.* iv. 123, t. 54. — Pallas, *Reise*, iii. 531.

[4] Woodville, *Med. Bot.* iii. 403, t. 149. — Rosenthal, *Syn. Pl. Diaphor.* 521.

[5] Le Maout & Decaisne, *Traité Gén. Bot.* English ed. 517.

[6] Don, *Gen. Syst.* iii. 847 (1834). — Loudon, *Arb. Brit.* ii. 1140.

Azalea Pontica, Linnæus, *Spec.* 150 (1753). — Pallas, *Fl. Ross.* ii. 51, t. 69. — *Bot. Mag.* xiii. 433; l. t. 2383. — Savi, *Flora Italiana*, iii. t. 107. — Guimpel, Otto & Hayne, *l. c.* 135, t. 109. — De Candolle, *l. c.* 718.

Rhododendron Ponticum, Schreber, *Nov. Act. Upsal.* i. 90 (not Linnæus) (1773).

Anthodendron flavum, Reichenbach, *Moessler Handb. Gewächsk.* ed. 2, i. 309 (1827).

[7] *The Expedition of Cyrus into Persia and the Retreat of the Ten Thousand Greeks*, Spelman, ed. 3, i. Book iv. 358. — Pallas, *l. c.* i. 43; ii. 51. — C. Wolley Dod, *Gard. Chron.* n. ser. xx. 793.

[8] Hooker f. *Himalayan Journals*, i. 190.

[9] Smith, *Exot. Bot.* i. 9, t. 6 (1804). — Hooker, *Exot. Fl.* iii. t. 168. — *Bot. Reg.* xi. t. 890; xv. t. 1240; xxiii. t. 1982. — De Candolle, *l. c.* 720. — *Bot. Mag.* lxxxviii. t. 5311. — Kurz, *Forest Fl. Brit. Burm.* ii. 93. — Hooker f. *Fl. Brit. Ind.* iii. 465.

[10] Brandis, *Forest Fl. Brit. Ind.* 281.

[11] Hooker f. *Rhododendrons of the Sikkim-Himalaya*, t. 8; *Fl. Brit. Ind.* iii. 474. — *Bot. Mag.* lxxx. t. 4788.

[12] Aitchison & Hemsley, *Jour. Linn. Soc.* xviii. 75.

[13] Aitchison, *Jour. Linn. Soc.* xviii. 12, 26 (1881).

[14] D. Don, *Edinb. Wern. Soc. Mem.* iii. 409 (1820). — Sweet, *Brit. Fl. Gard.* vi. t. 241. — De Candolle, *l. c.* 721. — *Bot. Mag.* lxvi. t. 3759. — Hooker f. *Fl. Brit. Ind.* iii. 466.

Rhododendron æruginosum, Hooker f. *Rhododendrons of the Sikkim-Himalaya*, t. 22 (1849).

[15] Brandis, *l. c.* 282.

[16] Don, *l. c.* iii. 845 (1834). — Royle, *Ill.* 260, t. 64, f. 1. — De Candolle, *l. c.* 724. — *Bot. Mag.* lxxviii. t. 4657; lxxx. t. 4802. — Hooker f. *Fl. Brit. Ind.* iii. 471.

Rhododendron salignum, Hooker f. *Rhododendrons of the Sikkim-Himalaya*, t. 23 A (1849).

Rhododendron elæagnoides, Hooker f. *l. c.* t. 23 B (1849).

[17] D. Don, *l. c.* (1820). — Royle, *l. c.* t. 64, f. 2. — De Candolle, *l. c.* 725. — *Bot. Mag.* lxviii. t. 3947. — Hooker f. *Fl. Brit. Ind.* iii. 472.

[18] Brandis, *l. c.*

[19] Spons, *Encyclopædia of the Industrial Arts, Manufactures, and Raw Commercial Products*, ii. 2010.

[20] Brandis, *l. c.* — Gamble, *Man. Ind. Timbers*, 236.

[21] One of the earliest hybrid Rhododendrons whose history is recorded was produced in the nursery of a Mr. Thompson of Mile End, near London, about 1820, by the accidental crossing of *Rhododendron Ponticum* with some species with deciduous leaves and

generally cultivated are the Azaleas and Rhododendrons of eastern North America and the Orient, and some of the Rhododendrons of the Himalayas, which display their magnificent evergreen foliage and splendid flowers in the temperate and humid regions of western and southern Europe.[1] Rhododendrons of garden origin and mixed blood are now, however, more often cultivated. These are chiefly of four races, Indian Azaleas, Ghent Azaleas, Catawbiense Rhododendrons, and Javanese Rhododendrons. The Indian Azaleas of the garden are improved forms of *Rhododendron Indicum*,[2] a native of China and Japan, which owes its name to the fact that it was first sent to Europe from India; in its native countries it is a variable plant with persistent or deciduous leaves and small and usually brick-red flowers; for centuries it has been cultivated by the Chinese and Japanese, who value it as a chief ornament of their gardens,[3] although improvement in the size, form, and coloring of its flowers is due to the skill of European gardeners, who, especially in Belgium, have devoted much attention to this plant. The race of Ghent Azaleas has been produced by crossing the yellow-flowered Oriental *Rhododendron flavum* with the North American *Rhododendron calendulaceum*,[4] *Rhododendron viscosum*,[5] and *Rhododendron nudiflorum*,[6] and then by crossing their hybrid progeny with each other and with the eastern Asiatic *Rhododendron Sinense*,[7] and later with the Californian *Rhododendron occidentale*[8] and with *Rhododendron arborescens*[9] of the Alleghany Mountains. The product of these crosses and of years of careful selection, carried on principally in Belgium and England, is a race

fragrant flowers. This plant, known as *Rhododendron azaleoides* or as *Rhododendron odoratum* (Andrews, *Bot. Rep.* vi. t. 379. — Guimpel, Otto & Hayne, *Abbild. Holz.* 15, t. 15. — Sweet, *Brit. Fl. Gard.* v. 117, t. 117. — Loudon, *Arb. Brit.* ii. 1131. — Seidel & Heynhold, *Rhodoraceæ*, 87. — Rand, *The Rhododendron*, 58. — *Gard. Chron.* n. ser. xii. 200. — W. Watson, *Gard. Chron.* ser. 3, xii. 761), is still valued in gardens as a hardy free-flowering dwarf shrub. Other hybrids between species of different sections of the genus have occasionally appeared. (See *Bot. Reg.* iii. t. 195; xxviii. t. 25. — Herbert, *Trans. Hort. Soc. Lond.* iv. 45; *Jour. Hort. Soc. Lond.* ii. 86; *Amaryllidaceæ*, 356. — *Bot. Mag.* xlix. t. 2308. — Paxton, *Mag. Bot.* ix. 79, t. — Anderson-Henry, *Jour. Royal Hort. Soc.* n. ser. iii. 106. — André, *Traité des Plantes de Terre de Bruyères*, 164; *Rev. Hort.* 1893, 369. — Burbidge, *Cultivated Plants*, 121, 297. — Focke, *Die Pflanzen-Mischlinge*, 243. — Masters, *Gard. Chron.* ser. 3, xiii. 665.)

[1] Llewelyn, *Gard. Chron.* n. ser. xvii. 558, 700. — W. Watson, *l. c.* 698.

[2] Sweet, *l. c.* v. 128, t. 128 (1833). — De Candolle, *Prodr.* vii. 726. — Maximowicz, *Mém. Acad. Sci. St. Pétersbourg*, sér. 7, xvi. 37 (*Rhododendreæ Asiæ Orientalis*). — Franchet & Savatier, *Enum. Pl. Jap.* i. 291. — Forbes & Hemsley, *Jour. Linn. Soc.* xxvi. 25 (with synonymy).

Azalea Indica, Linnæus, *Spec.* 150 (1753). — *Bot. Mag.* xxxvi. t. 1480; li. t. 2509; liii. t. 2667. — *Bot. Reg.* x. t. 811; xx. t. 1700, t. 1716; xxviii. t. 56. — *Fl. des Serres*, iii. t. 239, 242; viii. t. 796. — Savi, *Flora Italiana*, ii. t. 67.

[3] Kaempfer, *Amœn.* 845, t. — Rein, *Industries of Japan*, 263, 270.

[4] Torrey, *Fl. U. S.* i. 425 (1824). — Chapman, *Fl.* 265. — Gray, *Syn. Fl. N. Am.* ii. 41. — Watson & Coulter, *Gray's Man.* ed. 6, 320.

(?) *Azalea lutea*, Linnæus, *Spec.* 150 (in part) (1753).

Azalea calendulacea, Michaux, *Fl. Bor.-Am.* i. 151 (1803). — *Bot. Mag.* xli. t. 1721; xlvii. t. 2143. — Pursh, *Fl. Am. Sept.* i. 151. — Elliott, *Sk.* i. 238. — De Candolle, *l. c.* 717. — Gray, *Man.* 268.

[5] Torrey, *l. c.* (1824); *Fl. N. Y.* i. 439, t. 66. — Gray, *Syn. Fl. N. Am.* ii. 40. — Watson & Coulter, *l. c.*

Azalea viscosa, Linnæus, *l. c.* 151 (1753). — Michaux, *l. c.* 150. — Elliott, *l. c.* 241. — Savi, *l. c.* ii. t. 46. — Guimpel, Otto & Hayne, *l. c.* 38, t. 32. — De Candolle, *l. c.* 715. — Gray, *Man. l. c.* — Emerson, *Trees Mass.* ed. 2, ii. 438, t.

[6] Torrey, *Fl. U. S.* i. 424 (1824). — Chapman, *l. c.* — Gray, *Syn. Fl. N. Am.* ii. 41. — Watson & Coulter, *l. c.*

(?) *Azalea lutea*, Linnæus, *l. c.* 150 (in part) (1753).

Azalea nudiflora, Linnæus, *Spec.* ed. 2, 214 (1762). — *Bot. Mag.* v. t. 180. — *Bot. Reg.* ii. t. 120; xvi. t. 1367. — Mordant de Launay, *Herb. Amat.* iv. t. 213. — Elliott, *l. c.* — Guimpel, Otto & Hayne, *l. c.* 135, t. 110. — De Candolle, *l. c.* 716. — Gray, *Man. l. c.* — Emerson, *l. c.* 440, t.

Azalea canescens, Michaux, *l. c.* 150 (1803). — Pursh, *l. c.*

Azalea periclymenoides, Michaux, *l. c.* 151 (1803). — Pursh, *l. c.*

Azalea bicolor, Pursh, *l. c.* 153 (1814).

Rhododendron bicolor, Don, *Gen. Syst.* iii. 847 (1834).

Rhododendron canescens, Don, *l. c.* iii. 848 (1834).

[7] Sweet, *l. c.* iii. 290, t. 290 (1829). — Maximowicz, *l. c.* 28. — Franchet & Savatier, *l. c.* 289. — Forbes & Hemsley, *l. c.* 30.

Azalea Sinensis, Loddiges, *Bot. Cab.* ix. t. 885 (1824).

Azalea mollis, Blume, *Bijdr. Fl. Ned. Ind.* 853 (1826). — De Candolle, *l. c.* 718.

Azalea Pontica, var. *Sinensis*, Lindley, *Bot. Reg.* xv. t. 1253 (1829).

Rhododendron molle, Siebold & Zuccarini, *Abhand. Akad. Münch.* iv. pt. iii. 131 (1846).

Azalea Japonica, Gray, *Mem. Am. Acad.* n. ser. vi. 400 (1859).

[8] Gray, *Brewer & Watson Bot. Cal.* i. 458 (1876); *Syn. Fl. N. Am. l. c.*

Rhododendron calendulaceum, Hooker & Arnott, *Bot. Voy. Beechey*, 362 (not Torrey) (1841).

Azalea calendulacea, Bentham, *Pl. Hartweg.* 321 (not Michaux) (1857).

Azalea occidentalis, Torrey, *Pacific R. R. Rep.* iv. 116 (1857).

[9] Torrey, *Fl. U. S.* i. 425 (1824). — Chapman, *l. c.* — Gray, *Syn. Fl. N. Am.* ii. 41. — Sargent, *Garden and Forest*, i. 400, f. 64. — Watson & Coulter, *l. c.*

Azalea arborescens, Pursh, *l. c.* 152 (1814). — Gray, *Man.* 268.

Azalea fragrans, Rafinesque, *Ann. Nat.* 12 (1820).

of hardy shrubs with fragrant flowers in colors passing from white through yellow and orange to pink and red.[1] The Catawbiense Rhododendrons have been produced by crossing *Rhododendron Catawbiense*,[2] a native of the high summits of the southern Alleghany Mountains, which it sometimes covers with vast thickets, with *Rhododendron Ponticum*,[3] the offspring being again crossed with *Rhododendron arboreum* and other Indian species with bright-colored flowers, or with the North American *Rhododendron maximum*. The race of Javanese Rhododendrons, conspicuous for their brilliantly colored flowers and their habit of flowering continuously, has been obtained by English gardeners by interbreeding *Rhododendron Javanicum*,[4] *Rhododendron jasminiflorum*,[5] and other Malayan species with persistent foliage and yellow, orange, and scarlet flowers.[6]

The different species of Rhododendron in North America are sometimes injured by insects which bore into their trunks, and are occasionally disfigured by fungi.[7]

The generic name, from ῥόδον and δένδρον, was adopted by Linnæus for the species with persistent foliage.

[1] Lindley, *Bot. Reg.* xvi. under t. 1366. — W. Watson, *Gard. Chron.* ser. 3, xii. 742.

[2] Michaux, *Fl. Bor.-Am.* i. 258. — *Bot. Mag.* xl. t. 1671. — Elliott, *Sk.* i. 485. — De Candolle, *Prodr.* vii. 723. — Chapman, *Fl.* 266. — Gray, *Syn. Fl. N. Am.* ii. 42.

[3] Linnæus, *Spec.* ed. 2, 562 (1762). — Pallas, *Fl. Ross.* i. 43, t. 29. — *Bot. Mag.* xviii. t. 650. — Schmidt, *Oestr. Baumz.* iii. 4, t. 122. — *Nouveau Duhamel*, ii. 140, t. 41. — Savi, *Flora Italiana*, iii. t. 101. — Guimpel, Otto & Hayne, *Abbild. Holz.* 136, t. 111. — De Candolle, *l. c.* 721. — Loudon, *Arb. Brit.* ii. 1131, f. 931. — Boissier, *Fl. Orient.* iii. 971.

Rhododendron speciosum, Salisbury, *Prodr.* 287 (1796).

[4] Bennett, *Pl. Jav. Rar.* 85, t. 19 (1838). — *Bot. Mag.* lxxiii. t. 4336. — Paxton, *Mag. Bot.* xv. 217; *Fl. des Serres*, iii. t. 293, 294. — Miquel, *Fl. Ind. Bat.* ii. 1057.

[5] Hooker, *Bot. Mag.* lxxvi. t. 4524 (1850). — Miquel, *l. c.*

[6] G. Henslow, *Jour. Roy. Hort. Soc.* xiii. pt. ii. 240. — W. Watson, *l. c.* 698.

[7] *Exobasidium Azaleæ*, Peck, forms irregular globose greenish swellings at the tips of the branchlets of *Rhododendron viscosum* and of *Rhododendron nudiflorum* which are sometimes eaten, and in those parts of the country where the true May Apple, *Podophyllum peltatum*, Linnæus, does not occur, are called may apples. On *Rhododendron viscosum*, *Exobasidium discoideum*, Ellis, produces curious disks or cups usually on the under surface of the leaves; and *Synchytrium Vaccinii*, Thomas, which causes a serious disease among Cranberries and other small Ericaceæ in the middle states, also appears on this species. The leaves of the evergreen Rhododendrons are often discolored or killed in large spots by the growth of a number of different fungi, like Pestalozzia and Hendersonia, and in eastern Massachusetts are not infrequently affected by a leaf disease caused by the growth of *Phyllosticta Saccardoi*, Thuemen.

RHODODENDRON MAXIMUM.

Great Laurel. Rose Bay.

FLOWERS in terminal umbels from cone-like inflorescence-buds of numerous imbricated caducous bracts; corolla campanulate, rose-colored or white. Leaves lanceolate-oblong or lanceolate-obovate.

Rhododendron maximum, Linnæus, *Spec.* 392 (1753). — Marshall, *Arbust. Am.* 127. — Gærtner, *Fruct.* i. 304, t. 63, f. 6. — Wangenheim, *Nordam. Holz.* 63, t. 23, f. 49. — Moench, *Meth.* 45. — Willdenow, *Berl. Baumz.* 286; *Spec.* ii. 606; *Enum.* 451. — Poiret, *Lam. Dict.* vi. 265; *Ill.* ii. 488, t. 364, f. 1. — Schmidt, *Oestr. Baumz.* iii. 3, t. 121. — *Nouveau Duhamel*, ii. 141. — Michaux, *Fl. Bor.-Am.* i. 259. — Schkuhr, *Handb.* i. 362. — Persoon, *Syn.* i. 478. — Desfontaines, *Hist. Arb.* i. 221. — *Bot. Mag.* xxiv. t. 951. — Du Mont de Courset, *Bot. Cult.* ed. 2, iii. 326. — Michaux f. *Hist. Arb. Am.* iii. 144, t. 4. — Pursh, *Fl. Am. Sept.* i. 297. — Bigelow, *Fl. Boston.* 102. — Nuttall, *Gen.* i. 268. — Elliott, *Sk.* i. 483. — Hayne, *Dendr. Fl.* 57. — Nees von Esenbeck & Sinning, *Samml. Schönb. Gewäch.* 138, t. 60. — Guimpel, Otto & Hayne, *Abbild. Holz.* 137, t. 112. — Audubon, *Birds*, t. 103. — Don, *Gen. Syst.* iii. 843. — De Candolle, *Prodr.* vii. 722. — Hooker, *Fl. Bor.-Am.* ii. 43. — Spach, *Hist. Vég.* ix. 503. — Torrey, *Fl. N. Y.* i. 437. — Dietrich, *Syn.* ii. 1404. — Darlington, *Fl. Cestr.* ed. 3, 171. — Chapman, *Fl.* 265. — Curtis, *Rep. Geolog. Surv. N. Car.* 1860, iii. 97. — Koch, *Dendr.* ii. 169. — Emerson, *Trees Mass.* ed. 2, ii. 435, t. — Lauche, *Deutsche Dendr.* ed. 2, 257. — Gray, *Syn. Fl. N. Am.* ii. 42. — Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix. 99. — Watson & Coulter, *Gray's Man.* ed. 6, 321.

Rhododendron procerum, Salisbury, *Prodr.* 287 (1796).

A bushy tree, rarely thirty to forty feet in height, with a short crooked often prostrate trunk occasionally ten or twelve inches in diameter, and stout contorted branches which form a round head; or more often a broad shrub with many divergent twisted stems ten or twelve feet tall. The bark of the trunk is one sixteenth of an inch thick, light red-brown, and broken on the surface into small thin appressed scales. The branchlets, when they first appear, are green tinged with red, and are covered with dark red or slightly ferrugineous glandular-hispid tomentum; in their first winter they are dark green and glabrous; at the end of the second year they gradually turn bright red-brown, and ultimately are gray tinged with red, the thin bark separating on branches four or five years old into irregular persistent scales. The leaf-buds, which are formed at midsummer, are conical, dark green, axillary, or terminal on barren shoots, and are covered with many closely imbricated scales. The scales of the outer ranks are scarious and remain on the base of the growing shoot until it is nearly half-grown, and in falling mark it with numerous crowded ring-like scars. The scales of the inner ranks are accrescent, and are carried up on the growing shoot, which they cover until it is several inches long; they increase in length from the outer or lower to the inner or upper ranks, and at maturity are an inch and a half long, a quarter of an inch wide, and are gradually narrowed at the base and at the apex which terminates in a long slender point; they are light green and glabrous, and are closely held against the shoot by a resinous exudation from the glandular hairs which cover it, and in falling mark the branches with numerous conspicuous narrow remote scars which do not entirely disappear for three or four years. The leaves are ovate-lanceolate or obovate-lanceolate, acute or short-pointed at the apex, narrowly wedge-shaped, or rounded at the base, and revolute in vernation; at first they are coated with gland-tipped hairs which are pale, or ferrugineous on the midribs and petioles, and form a thick tomentose covering; at maturity they are glabrous, thick, and coriaceous, dark green and lustrous on the upper surface, usually pale or whitish on the lower, four to twelve inches long and an inch and a half to two inches and a half wide, with thickened slightly revolute margins, broad pale midribs impressed on the upper side, and obscure reticulate veinlets; they are borne on stout petioles ridged above, rounded below, and an inch or an inch and a half

in length, and remain on the branches two or three years. The inflorescence-buds are formed in summer, and at first are surrounded by several loose narrow leaf-like scales; when fully grown in September they are cone-like, an inch and a half long, half an inch broad, and covered with many imbricated ovate bracts rounded and contracted at the apex into long slender points; they begin to open late in June, after the shoots of the year, which develop immediately below the inflorescence-buds from buds in the axils of upper leaves, have reached their full length. The flowers are produced in sixteen to twenty-four-flowered umbellate clusters four or five inches in diameter, and are borne on slender pink pedicels; these are covered with glandular white hairs, furnished at the base with two linear scarious bractlets, and are developed from the axils of the bracts of the inner ranks of the inflorescence-buds. As the flower-buds open, the bracts gradually fall; they are accrescent, scarious, very resinous, and puberulous, especially on the outer surface near the base; when fully grown, those of the outer ranks are an inch long and one third of an inch broad, and in falling mark the base of the stem of the inflorescence with many conspicuous ring-like scars; those of the inner ranks are an inch and a half long, a quarter of an inch wide, lanceolate, and contracted into long slender points. The calyx is light green and puberulous, with rounded rather remote lobes, and in the bud does not entirely inclose the corolla, which is campanulate, gibbous on the posterior side, puberulous in the throat, light rose-color,[1] purplish,[2] or white,[3] an inch in length, cleft to the middle into oval rounded lobes with conspicuous central veins; the upper lobe is marked on the inner face by a cluster of yellow-green spots; and on the outer surface at the bottom of each sinus there is a conspicuous dark red gland; before anthesis the corolla is prominently five-angled or ridged, white below and marked above with five pink bands corresponding with the lobes. The stamens vary from eight to twelve in number; they are proterandrous, white, inserted on the bright green disk, and vary in length from the anterior to the posterior part of the flower; the filaments are enlarged and flattened at the base, slightly bent inward above the middle, and bearded with stiff white hairs, the four or five shorter ones at the back of the flower for more than half their length and the longer ones only near the base. The ovary is ovate, green, coated with short glandular pale hairs, and crowned with a long slender glabrous white declining style, which is club-shaped and inflexed at the apex, and terminates in a five-rayed scarlet stigma. The capsule is dark red-brown, ovate, half an inch in length, glandular-hispid, surrounded at the base by the persistent calyx, and crowned with the style; it has papery walls, and the thin endocarp is separable from the light brown slightly thinner exocarp; it ripens and sheds its seed in the autumn, although the clusters of open capsules remain on the branches until the following summer. The seed is oblong, flattened, and covered with a loose coat prolonged at both ends into scarious fringed appendages.

Rhododendron maximum is distributed from Nova Scotia to the northern shores of Lake Erie in the province of Ontario,[4] and southward through New York and New England and along the Alleghany Mountains to northern Georgia. At the north it is rare, inhabiting deep cold swamps in a few isolated situations; on the mountains of western Pennsylvania it is more abundant, and farther south becomes exceedingly common, occupying the steep rocky banks of streams to an elevation of about three thousand feet above the sea, and reaching its greatest size on the lower slopes of the high mountains of Tennessee and the Carolinas, where it often forms thickets hundreds of acres in extent, impassable to man, and the secure retreat of the bear, the fox, and the wild-cat.

The wood of *Rhododendron maximum* is heavy, hard, strong, although rather brittle, and close-grained; it contains numerous thin medullary rays, and is light clear brown, with thin lighter colored

[1] *Rhododendron maximum*, var. *roseum*, Pursh, *Fl. Am. Sept.* i. 297 (1814). — Elliott, *Sk.* i. 484.

[2] *Rhododendron maximum*, var. *purpureum*, Pursh, *l. c.* (1814). — Elliott, *l. c.*

Rhododendron purpureum, Don, *Gen. Syst.* iii. 843 (1834). — Loudon, *Arb. Brit.* ii. 1134. — Dietrich, *Syn.* ii. 1404.

[3] *Rhododendron maximum*, var. *album*, Pursh, *l. c.* (1814). — Elliott, *l. c.* 484.

*Rhododendron Pursh*ii, Don, *l. c.* (1834). — Loudon, *l. c.* 1135. — Dietrich, *l. c.*

[4] Brunet, *Cat. Vég. Lig. Can.* 40. — Lawson, *Proc. & Trans. Nova Scotia Inst. Nat. Sci.* iv. pt. ii. 172. — Macoun, *Cat. Can. Pl.* i. 302.

sapwood. The specific gravity of the absolutely dry wood is 0.6303, a cubic foot weighing 39.28 pounds. It is occasionally made into the handles of tools, and has been used as a substitute for boxwood in engraving. A decoction of the leaves is occasionally used in domestic practice in the treatment of rheumatism.[1]

The earliest account of *Rhododendron maximum* appears in the Appendix to Catesby's *Natural History of Carolina*,[2] published in 1748. According to Aiton,[3] it was first cultivated in Europe twelve years earlier by Peter Collinson in his garden near London.

As a garden plant *Rhododendron maximum* is one of the hardiest and most easily cultivated of all Rhododendrons, although the young branchlets, rising above and partly concealing the flower-clusters, make it less showy when in bloom than those species which do not make their annual growth until after the flowers have faded. It flourishes in all soils not impregnated with lime, which is fatal to Rhododendrons; it is easily raised from seed and easily transplanted, and it produces its clusters of lovely slightly fragrant flowers at midsummer, long after those of the other species have faded. Before the general introduction into gardens of the hybrids of the Catawbiense race, with larger and more brilliant flowers, *Rhododendron maximum* was more valued and more frequently planted than at present. Its blood can be traced in several distinct and beautiful hybrids.[4]

[1] B. S. Barton, *Coll.* ed. 2, i. 18. — Bigelow, *Med. Bot.* iii. 101, t. 51. — Griffith, *Med. Bot.* 428. — Porcher, *Resources of Southern Fields and Forests*, 380. — *U. S. Dispens.* ed. 16, 1907.

[2] *Chamærhododendros, lauri-folio semper virens, floribus bullatis corymbosis*, ii. Appx. 17, t. 17, f. 2.

Kalmia foliis lanceolato-ovatis nitidis subtus ferrugineis, corymbosis terminalibus, Miller, *Dict. Icon.* ii. 152, t. 228.

Ledum lauro-cerasi folio, Linnæus, *Amœn.* ii. 201.

Rhododendron foliis nitidis ovalibus, margine acuto reflexo, Clayton, *Fl. Virgin.* ed. 2, 66. — Trew, *Pl. Ehret*, 32, t. 66.

[3] *Hort. Kew.* ii. 67. — Loudon, *Arb. Brit.* ii. 1134, f. 932.

[4] One of the most distinct of these hybrids was obtained in England many years ago by a cross with one of the white-flowered American Azaleas (*Bot. Reg.* iii. t. 195. — *Bot. Mag.* lxii. t. 3454. — Seidel & Heynhold, *Rhodoraceæ*, 89); another, *Rhododendron Duc de Brabant*, was obtained by a Belgian nurseryman in 1853 from a cross with *Rhododendron Catawbiense* (*Fl. des Serres*, viii. 220, 227, t. 836, 837). The blood of *Rhododendron maximum* can be traced also in the well-known Catawbiense hybrid, *Delicatissimum*, in *Rhododendron Wellsianum*, raised at the Knaphill Nurseries at Woking in England, and in *Rhododendron Madame van Houtte* (*Fl. des Serres*, xv. 199, t. 1606).

EXPLANATION OF THE PLATES.

PLATE CCXXXVIII. RHODODENDRON MAXIMUM.

1. A flowering branch, natural size.
2. Diagram of a flower.
3. A flower, the corolla removed, natural size.
4. A stamen, enlarged.
5. Vertical section of a flower, the corolla removed, enlarged.
6. An ovule, much magnified.

PLATE CCXXXIX. RHODODENDRON MAXIMUM.

1. A branch with a cluster of ripe fruit and inflorescence-bud, natural size.
2. Cross section of a fruit, enlarged.
3. A fruit, showing the open valves and the placentiferous central column, enlarged.
4. A seed, enlarged.
5. Vertical section of a seed, enlarged.
6. An embryo, much magnified.

C.E. Faxon del.

Picart sc.

RHODODENDRON MAXIMUM, L.

A. Riocreux direx.t

Imp. R. Taneur, Paris.

C.E. Faxon del.

Picart sc.

RHODODENDRON MAXIMUM, L

A. Riocreux direx.t

Imp. R. Taneur, Paris.

ICACOREA.

FLOWERS perfect or polygamo-diœcious; calyx free, 5 or rarely 4-lobed or parted, the divisions contorted or imbricated in æstivation; corolla gamopetalous, 5 or rarely 4 or 6-parted, the divisions dextrorsely or sinistrorsely contorted in æstivation; stamens 5; ovary superior, 1-celled; ovules few or numerous. Fruit a dry 1-seeded drupe. Leaves simple, alternate, membranaceous or coriaceous, destitute of stipules.

Icacorea, Aublet, *Pl. Guian.* ii. Suppl. 1 (1775). — Baillon, *Hist. Pl.* xi. 331.

Bladhia, Thunberg, *Nov. Gen.* i. 6 (1781); *Fl. Jap.* 7. — A. L. de Jussieu, *Gen.* 421.

Ardisia, Swartz, *Prodr.* 48 (1788). — Endlicher, *Gen.* 736. — Meisner, *Gen.* 253. — Bentham & Hooker, *Gen.* ii. 645. — Engler & Prantl, *Pflanzenfam.* iv. pt. i. 93.

Pyrgus, Louriero, *Fl. Cochin.* 120 (1790).

Small trees or shrubs, sometimes partly herbaceous, glabrous, pubescent or rarely tomentose. Leaves alternate, sessile or petiolate, entire or rarely dentate or crenate, membranaceous or coriaceous, punctate with immersed resinous dots or short lines at first pellucid, ultimately dark. Flowers in terminal or rarely in axillary branched panicles, resinous-punctate, pedicellate, the pedicels bibracteolate at the base or ebracteolate. Bracts and bractlets minute, scarious, deciduous or caducous. Calyx five or rarely four-lobed or parted, persistent. Corolla rotate, five or rarely four or six-parted, the segments short or elongated, white or rose-colored. Stamens five, exserted; filaments short or nearly obsolete, rarely somewhat elongated, free, inserted on the throat of the corolla opposite its divisions; anthers usually sagittate-lanceolate, acute, acuminate or apiculate, attached on the back just above the base, introrse, two-celled, the cells opening longitudinally sometimes nearly to the base. Ovary globose, one-celled; stigma short or elongated, simple, tipped by a minute undivided style; ovules few or numerous, immersed in a free central globose resinous-punctate placenta, peltate, amphitropous; raphe ventral; micropyle superior. Fruit globose or rarely obovoid, naked or crowned at the apex with the remnants of the style, black, blue, or scarlet; exocarp thin, usually dry; endocarp usually crustaceous or bony, one-seeded. Seed solitary, globose, concave and more or less lobed at the base, inclosed with the abortive lower ovules by the thin membranous remnants of the placenta adnate to the interior surface of the endocarp; testa thin, resinous-punctate; hilum basilar, concave, conspicuous. Embryo cylindrical, transverse, in copious corneous or cartilaginous albumen; cotyledons flat on the inner face, rounded on the back, shorter than the slender radicle.

About two hundred living species of Icacorea, inhabitants of tropical and subtropical regions of the two hemispheres, are distinguished,[1] and traces of many others appear in the tertiary rocks of central Europe.[2]

The genus has few useful properties; the fruit of some of the species is said to be edible,[3] and

[1] A. de Candolle, *Prodr.* viii. 120, 670. — Walpers, *Rep.* vi. 452; *Ann.* iii. 10. — Miquel, *Fl. Ind. Bat.* ii. pt. i. 1015; Suppl. 574. — Örsted, *Videnskab. Medd. fra Nat. For. Kjobenh.* 1861, 6, t. 2 (excl. sec. i.). — Bentham, *Fl. Hongk.* 206; *Fl. Austral.* iv. 276. — Oliver, *Fl. Trop. Afr.* iii. 495. — Miquel, *Martius Fl. Brasil.* x. 281. — Grisebach, *Fl. Brit. W. Ind.* 394. — Franchet & Savatier, *Enum. Pl. Jap.* i. 304. — Hemsley, *Bot. Biol. Am. Cent.* ii. 291. — Hooker f. *Fl. Brit. Ind.* iii. 518. — Forbes & Hemsley, *Jour. Linn. Soc.* xxvi. 63.

[2] Zittel, *Handb. Palæontolog.* ii. 737.

[3] Le Maout & Decaisne, *Traité Gén. Bot.* English ed. 534.

that of others is occasionally used medicinally in their native countries.[1] A number of species are cultivated for the beauty of their handsome evergreen foliage and bright-colored fruit.[2]

The generic name is of Carib origin.

[1] Rosenthal, *Syn. Pl. Diaphor.* 503. — Baillon, *Hist. Pl.* xi. 328.

[2] *Bot. Mag.* xl. t. 1677, t. 1678 ; xlv. t. 1950 ; l. t. 2364. — *Bot. Reg.* vii. t. 533 ; viii. t. 638 ; x. t. 827 ; xxii. t. 1892. — Nicholson, *Dict. Gard.* i. 108.

ICACOREA PANICULATA.

Marlberry. Cherry.

FLOWERS in broad terminal many-flowered panicles; corolla-lobes sinistrorsely contorted in æstivation. Fruit black. Leaves ovate to lanceolate-oblong or lanceolate-obovate.

Icacorea paniculata, Sudworth, *Garden and Forest*, vi. 324 (1893).

Cyrilla paniculata, Nuttall, *Am. Jour. Sci.* v. 290 (1822).

Pickeringia paniculata, Nuttall, *Jour. Phil. Acad.* vii. pt. i. 95 (1834). — De Candolle, *Prodr.* vii. 733.

Ardisia Pickeringia, Nuttall, *Sylva*, iii. 69, t. 102 (1849).— A. de Candolle, *Ann. Sci. Nat.* sér. 2, xvi. 95; *Prodr.* viii. 124. — Chapman, *Fl.* 277. — Gray, *Syn. Fl. N. Am.* ii. 65. — Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix. 100.

Bladhia paniculata, Sudworth, *Garden and Forest*, iv. 239 (1891).

A slender tree, in Florida rarely more than twenty feet in height, with a short trunk four or five inches in diameter, many thin upright branches which form a narrow formal head, stout terete often contorted branchlets, and fibrous roots. The bark of the trunk, which is an eighth of an inch thick and is light gray or nearly white and roughened with minute lenticels, separates into large thin papery plates disclosing the dark brown inner bark. The branchlets, when they first appear, are rusty brown or dark orange-colored and slightly puberulous, and in their second year are dark red-brown or ashy gray and marked with many minute circular lenticels and with thin nearly orbicular flat leaf-scars which display in the centre a group of fibro-vascular bundle-scars. The leaves are ovate to lanceolate-oblong or lanceolate-obovate, acute or rounded at the narrow apex, wedge-shaped and gradually contracted at the base into stout grooved petioles, and entire, with thickened and slightly revolute margins; they are three to six inches long, an inch to an inch and a half broad, thick and coriaceous, glabrous and marked with minute scattered black dots, dark yellow-green on the upper surface and pale below, with broad midribs yellow and conspicuous on the under side and slightly grooved on the upper, slender obscure primary veins and reticulate veinlets; they appear late in the summer or in early autumn and fall before the trees flower in the following year. The fragrant flowers are produced in terminal rusty brown puberulous panicles three or four inches in length and breadth, the branches being often developed from the axils of the upper leaves; they are borne on slender elongated pedicels without bractlets and developed from the axils of linear acute caducous bracts; in Florida they usually open in November, although sometimes as early as July. The calyx is ovate and is divided nearly to the base into five ovate acute lobes, scarious and ciliate on the margins and marked on the back with dark lines. The corolla is five-parted, with oblong rounded divisions sinistrorsely overlapping, or with one lobe wholly outside and one inside in the bud, which is oblong, ovate, acute, and marked with longitudinal black lines, and near the apex with a few minute bright red spots; after opening, the lobes, which are conspicuously marked with red spots on the inner surface near the base, become reflexed. The stamens consist of short broad filaments contracted by a geniculate fold in the middle, and of large sagittate orange-colored anthers longer than the filaments, their cells opening longitudinally almost to the base. The ovary is glandular, globose, and gradually contracted into a long slender style tipped with a simple stigma, and, before the opening of the corolla, exserted from its apex. The fruit, which ripens in early spring, is globose, a quarter of an inch in diameter, surrounded at the base by the persistent calyx, tipped with the remnants of the style and roughened with resinous glands; when fully grown it is at first dark brown but ultimately becomes black and lustrous; the flesh is thin and dry, and adheres to the thin crustaceous light

brown stone. The seed is conspicuously lobed at the base and covered with a thin bright red-brown resinous-punctate coat.

Icacorea paniculata is distributed in Florida from Mosquito Inlet to the southern keys on the east coast, and from the shores of the Caloosa River to Cape Romano on the west coast. Usually a shrub, on the shores of Bay Biscayne and on some of the southern keys it occasionally attains the size and habit of a tree. It also inhabits the Bahama Islands,[1] Cuba,[2] and southern Mexico.[3]

The wood of *Icacorea paniculata* is heavy, hard, very close-grained, and susceptible of receiving a beautiful polish; it contains numerous conspicuous medullary rays, and is rich brown beautifully marked with darker medullary rays, with thick lighter colored sapwood. The specific gravity of the absolutely dry wood is 0.8602, a cubic foot weighing 53.61 pounds.

Icacorea paniculata was first discovered early in the present century in eastern Florida by Nathaniel A. Ware.[4]

[1] Eggers, No. 4196.
[2] Grisebach, *Cat. Pl. Cub.* 163.
[3] Hemsley, *Bot. Biol. Am. Cent.* ii. 294.
[4] See i. 86.

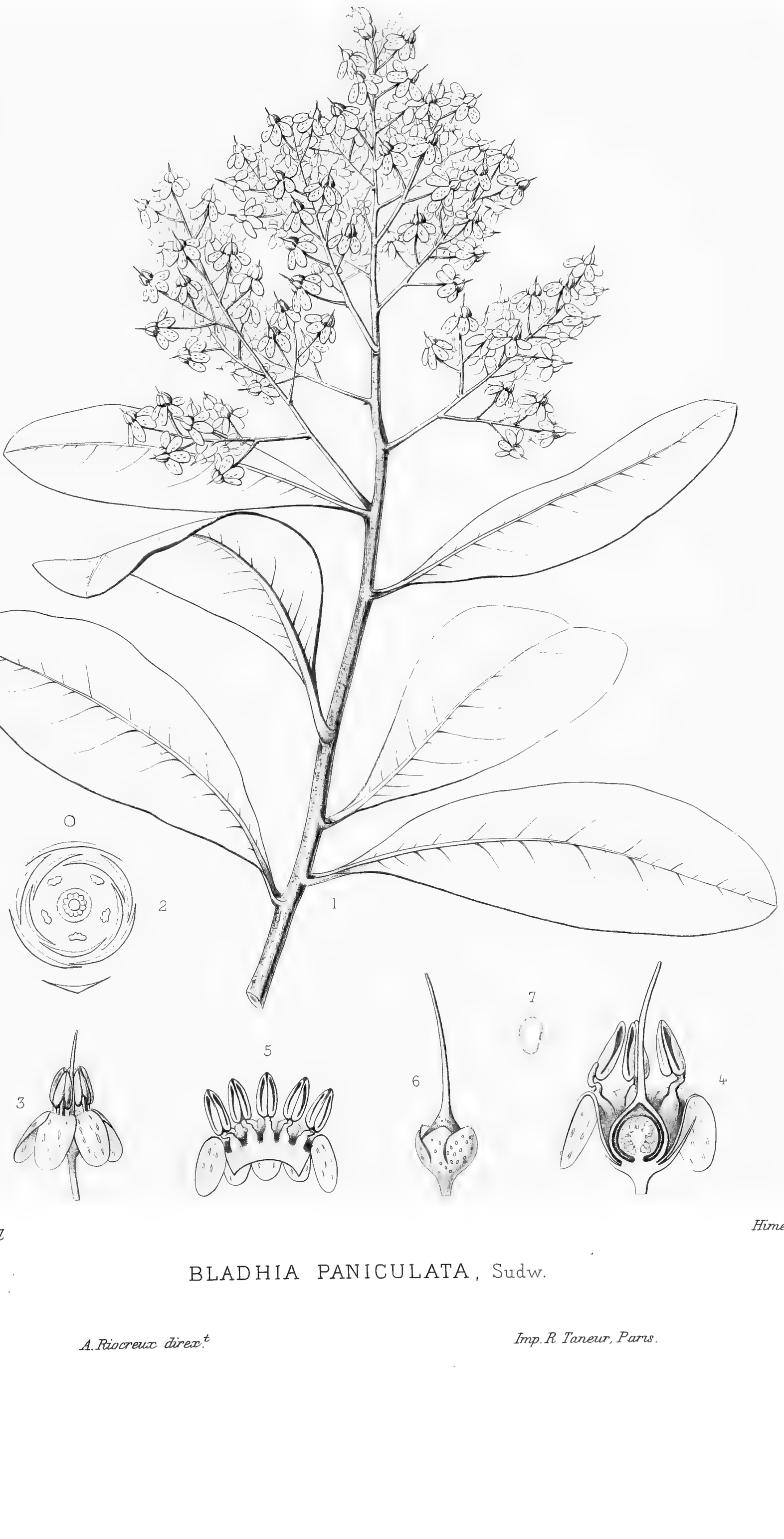
EXPLANATION OF THE PLATES.

Plate CCXL. Icacorea paniculata.

1. A flowering branch, natural size.
2. Diagram of a flower.
3. A flower, enlarged.
4. Vertical section of a flower, enlarged.
5. A corolla, displayed, enlarged.
6. A flower, the corolla removed, enlarged.
7. An ovule, much magnified.

Plate CCXLI. Icacorea paniculata.

1. A fruiting branch, natural size.
2. A fruit, enlarged.
3. Vertical section of a fruit, enlarged.
4. A seed, enlarged.
5. An embryo, much magnified.



C.E. Faxon del

Himely sc.

BLADHIA PANICULATA, Sudw.

A. Riocreux direx.t

Imp. R Taneur, Paris.

C.E. Faxon del. Picart sc.

BLADHIA PANICULATA, Sudw.

A. Riocreux direx.t - Imp. R. Taneur, Paris.

JACQUINIA.

FLOWERS perfect; calyx 5-parted, the lobes imbricated in æstivation; corolla gamopetalous, 5-lobed, the lobes imbricated in æstivation; stamens 5; ovary superior, 1-celled; ovules numerous. Fruit baccate, few or many-seeded. Leaves opposite or subverticillate, entire, persistent, destitute of stipules.

Jacquinia, Jacquin, *Hist. Stirp. Am.* 53 (1763). — Linnæus, *Gen.* ed. 6, 101. — A. L. de Jussieu, *Gen.* 151. — Endlicher, *Gen.* 737. — Meisner, *Gen.* 252. — Bentham & Hooker, *Gen.* ii. 650. — Engler & Prantl, *Pflanzenfam.* iv. pt. i. 89, f. 52, F. — Baillon, *Hist. Pl.* xi. 329.
Bonellia, Bertero, *Colla Hort. Ripul.* 21 (1824).

Trees or shrubs, with terete or slightly many-angled branchlets, and fibrous roots. Leaves opposite or subverticillate, obovate-cuneate or lanceolate, rounded and sometimes emarginate or acute or cuspidate at the apex, entire, coriaceous, often punctate with pellucid or ultimately dark glands, persistent. Flowers in terminal or axillary racemes, corymbs, or fascicles. Pedicels slender, produced from the axils of minute ovate acute persistent bracts, ebracteolate. Calyx free, five-parted, the lobes slightly ciliate on the margins, rounded at the apex, persistent. Corolla hypogynous, rotate or campanulate, yellow or purple, the lobes of the limb obtuse and spreading, furnished in the throat opposite the sinuses of the limb with five petal-like ovate obtuse spreading staminodia. Stamens five, inserted on the corolla opposite its lobes near the base of the short tube; filaments complanate, broad at the bottom; anthers oblong or ovate, attached on the back above the base, extrorse, two-celled, the cells opening longitudinally. Ovary ovoid, gradually contracted into a cylindrical or conical style crowned by a slightly five-lobed stigma; ovules peltate, attached to a free central ovoid fleshy placenta, ascending, amphitropous; raphe dorsal; micropyle inferior. Fruit ovoid or globose, crowned by the remnants of the persistent style, thin-walled, crustaceous or coriaceous. Seeds immersed in the thickened mucilaginous placenta filling the cavity of the fruit, ovoid, compressed; testa membranaceous, punctate. Embryo eccentric, surrounded by thick cartilaginous albumen; cotyledons ovate, shorter than the elongated inferior radicle turned towards the broad ventral hilum.

Jacquinia is tropical American; the five or six species which are known are distributed through Mexico,[1] Central America,[2] Brazil,[3] and the West Indies, one species reaching southern Florida.

The genus has few useful properties. The branches of the West Indian species are said to have been used by the Caribs to poison or stupefy fish in rivers.[4] The fruits of *Jacquinia armillaris* are sometimes strung into bracelets and necklaces, and the leaves have been used on the Bahama Islands as a substitute for soap.[5]

The generic name perpetuates the memory of the distinguished botanist Nicolaus Joseph Jacquin.[6]

[1] Hemsley, *Bot. Biol. Am. Cent.* ii. 294. — Gray, *Mem. Am. Acad.* n. ser. v. 325 (*Pl. Thurber.*).

[2] Humboldt, Bonpland & Kunth, *Nov. Gen. et Spec.* iii. 251. — Örsted, *Videnskab. Medd. fra Nat. For. Kjobenh.* 1861, 2.

[3] Miquel, *Martius Fl. Brasil.* x. 280.

[4] Martius, *Fl. Brasil.* x. 322. — Rosenthal, *Syn. Pl. Diaphor.* 504. — Baillon, *Hist. Pl.* xi. 328. — *Treasury of Botany*, 634.

[5] Catesby, *Nat. Hist. Car.* i. 98.

[6] Nicolaus Joseph Jacquin (1727–1818), a native of Leyden and a pupil in Paris of Bernard de Jussieu, was sent by the Austrian government to gather plants in tropical America for the Botanic Gardens of Vienna and Schoenbrunn. He remained in the West Indies and South America from 1755 to 1763, and returning to Europe became professor of botany at Chemnitz and then at Vienna. In 1806 Jacquin was created Baron by the Austrian government. He is the author of many classical works, including those in which his important American discoveries are described.

JACQUINIA ARMILLARIS.

Joe Wood.

FLOWERS straw-colored, in terminal and axillary racemes. Leaves cuneate-spatulate or obovate-oblong.

Jacquinia armillaris, Jacquin, *Enum. Pl. Carib.* 15 (1760); *Hist. Stirp. Am.* 53, t. 39; *Hist. Select. Stirp. Am.* 31, t. 56. — Linnæus, *Spec.* ed. 2, 272. — Miller, *Dict.* ed. 8, No. 2. — *Icon. Am. Gewäch.* i. 15, t. 49. — Aiton, *Hort. Kew.* i. 257. — Lamarck, *Dict.* iii. 195; *Ill.* ii. 46, t. 121, f. 1. — Willdenow, *Spec.* i. pt. ii. 1064; *Enum.* 246. — Persoon, *Syn.* i. 234. — Roemer & Schultes, *Syst.* iv. 490. — Sprengel, *Syst.* i. 668. — Don, *Gen. Syst.* iv. 24. — Dietrich, *Syn.* i. 638. — A. de Candolle, *Prodr.* viii. 149. — Chapman, *Fl.* 276. — Gray, *Syn. Fl. N. Am.* ii. 66. — Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix. 100.

Jacquinia arborea, Vahl, *Eclog.* i. 26 (1796). — Willdenow, *Spec.* i. pt. ii. 1064. — Persoon, *Syn.* i. 234. — Roemer & Schultes, *Syst.* iv. 490. — Sprengel, *Syst.* i. 668. — Don, *Gen. Syst.* iv. 24. — Dietrich, *Syn.* i. 638. — A. de Candolle, *Prodr.* viii. 149. — Miquel, *Martius Fl. Brasil.* x. 282, t. 27, f. 2.

Jacquinia armillaris, β. arborea, Grisebach, *Fl. Brit. W. Ind.* 397 (1864).

A tree, twelve to fifteen feet in height, with a straight trunk six or seven inches in diameter, stout rigid spreading branches which form a compact regular round-topped head, and slightly many-angled branchlets. The bark of the trunk is thin, smooth, blue-gray, and usually more or less marked with pale or nearly white blotches. The branches, when they first appear, are yellow-green or light orange-colored and are coated with short soft pale or ferrugineous pubescence; in their second year they become terete, darker and sometimes reddish brown, and are marked with the nearly orbicular depressed conspicuous leaf-scars and with many scattered black dots; in their third year they turn red-brown or ashy gray and become glabrous. The leaves, which are alternate and crowded near the ends of the branches, are cuneate-spatulate or obovate-oblong, rounded or emarginate or often apiculate at the apex, gradually contracted below into short stout puberulous petioles abruptly enlarged at the base, and are entire, with thickened slightly revolute margins; they are thick and coriaceous, yellow-green, nearly veinless, with very obscure midribs, and covered on the lower surface with pale dots; they are from one to three inches in length and from a quarter of an inch to an inch in breadth, and remain on the branches until after the appearance of the new leaves of the following year. The flowers, which appear in Florida from November until June, are produced in terminal and axillary many-flowered glabrous racemes two or three inches long, on slender club-shaped pedicels half an inch in length and produced from the axils of minute ovate coriaceous reddish bracts which are slightly ciliate on the margins; they are one third of an inch across when expanded, with pale straw-colored corollas. The fruit, which ripens in the autumn, is nearly globose, one third of an inch in diameter, and orange-red when fully ripe, with thin crustaceous walls inclosing the thick enlarged mucilaginous placenta in which are immersed the oblong rounded seeds covered with light red-brown punctate coats.

In Florida *Jacquinia armillaris* is distributed from Sanibel Island to the southern keys and to the neighboring borders of the Everglades; it grows close to the shore on dry coral soil, and, always exceedingly rare, is most abundant and attains its largest size on the Marquesas Keys. It inhabits the Bahamas[1] and is scattered along the Antillian coasts[2] to those of southern Mexico,[3] Central America, Venezuela,[4] and northern Brazil.[5]

[1] Hitchcock, *Missouri Bot. Gard.* iv. 104.

[2] Vahl, *Eclog.* i. 26. — Swartz, *Obs.* 85. — Lunan, *Hort. Jam.* i. 390. — Grisebach, *Fl. Brit. W. Ind.* 397. — Eggers, *Bull. U. S. Nat. Mus.* No. 13, 67 (*Fl. St. Croix and the Virgin Islands*).

[3] Bentham, *Bot. Voy. Sulphur*, 123. — Hemsley, *Bot. Biol. Am. Cent.* ii. 294.

[4] Seemann, *Jour. Bot.* iii. 279.

[5] Miquel, *Martius Fl. Brasil.* x. 282, t. 27, f. 1.

The wood of *Jacquinia armillaris* is heavy, hard, very close-grained, and susceptible of receiving a beautiful polish; it contains numerous conspicuous medullary rays, and is rich brown beautifully marked with darker medullary rays. The specific gravity of the absolutely dry wood is 0.6948, a cubic foot weighing 43.30 pounds.

Jacquinia armillaris was discovered on the island of Jamaica by Sir Hans Sloane, and the first account of it was published in his Catalogue of Jamaica Plants in 1696.[1] In the United States it was first noticed on Key West by Dr. J. L. Blodgett.

[1] *Arbor baccifera, laurifolia, fructu corallino ribium instar racemoso calyculato venenato. Currans-tree,* 167 ; *Nat. Hist. Jam.* ii. 89, t. 190, f. 2. — Ray, *Hist. Pl.* iii. *Dendr.* 50.

Frutex Buxi foliis oblongis, baccis pallide viridibus apice donatis, Catesby, *Nat. Hist. Car.* i. 93, t. 93.

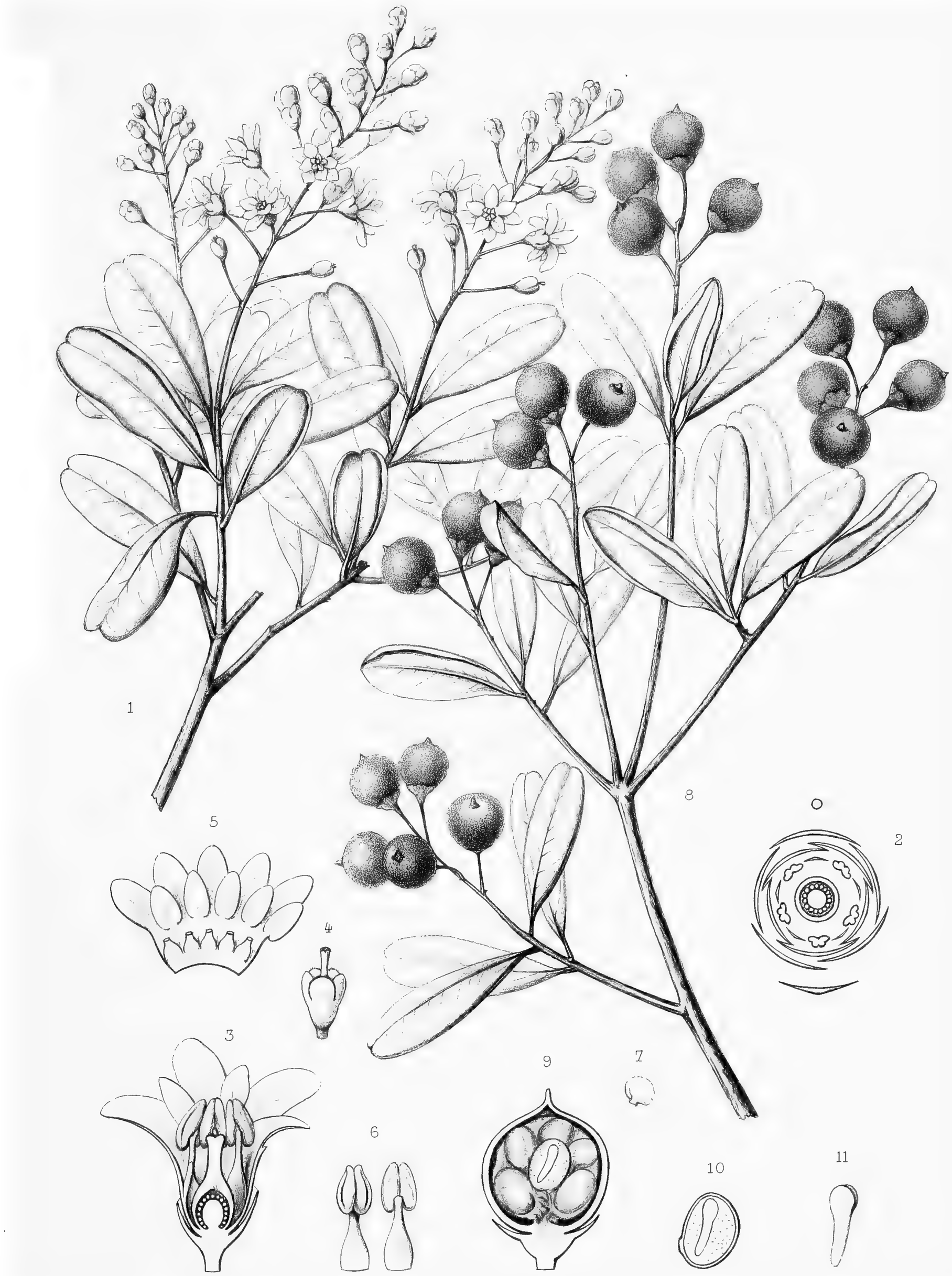
Chrysophyllum. Barbasco, Loefling, *Iter,* 204.

Chrysophyllo fructu adfinis, foliis pungentibus; vulgo Barbasco, Loefling, *l. c.* 277.

EXPLANATION OF THE PLATE.

PLATE CCXLII. JACQUINIA ARMILLARIS.

1. A flowering branch, natural size.
2. Diagram of a flower.
3. Vertical section of a flower, enlarged.
4. A flower, the corolla removed, enlarged.
5. A corolla displayed, the anthers removed, enlarged.
6. A stamen, front and rear views, enlarged.
7. An ovule, much magnified.
8. A fruiting branch, natural size.
9. Vertical section of a fruit, enlarged.
10. Vertical section of a seed, enlarged.
11. An embryo, much magnified.



C.E.Faxon del. *Rapine sc.*

JACQUINIA ARMILLARIS, Jacq.

A.Riocreux direx.t *Imp. R.Taneur, Paris.*

CHRYSOPHYLLUM.

FLOWERS perfect; calyx 5 or rarely 6 or 7-parted, the divisions nearly equal, imbricated in æstivation, deciduous; corolla gamopetalous, 5 or rarely 6 or 7-lobed, the lobes imbricated in æstivation; stamens as many as the lobes of the corolla; disk 0; ovary superior, 5 or rarely 6 to 10-celled; ovules solitary in each cell. Fruit a fleshy or coriaceous 1 or few-seeded berry. Leaves alternate, usually clothed on the lower surface with brilliant golden or copper-colored pubescence, persistent, destitute of stipules.

Chrysophyllum, Linnæus, *Gen.* 361 (1737). — A. L. de Jussieu, *Gen.* 152. — Meisner, *Gen.* 251. — Endlicher, *Gen.* 739. — Bentham & Hooker, *Gen.* ii. 653. — Engler & Prantl, *Pflanzenfam.* iv. pt. i. 147. — Baillon, *Hist. Pl.* xi. 293.

Cainito, Adanson, *Fam. Pl.* ii. 166 (1763).

Nycterisition, Ruiz & Pavon, *Prodr. Fl. Peruv.* 30 (1794).

Trees, with terete unarmed branchlets, usually coated while young with dense tomentum, naked buds, and milky juice. Leaves short-petiolate, entire, coriaceous, penniveined, the veins usually numerous and arcuate near the margins, or remote, connected by transverse reticulate veinlets, bright green and glabrous on the upper surface and coated on the lower with brilliant silky golden or copper-colored pubescence or tomentum, or in some Old World species naked on the lower surface, persistent. Flowers pedicellate or subsessile, minute, in dense many-flowered fascicles, axillary or from leafless thickened nodes of previous years. Pedicels ebracteolate, produced from the axils of minute acute deciduous bracts. Calyx generally deeply parted, the divisions obtuse, almost one-ranked, persistent. Corolla hypogynous, tubular, campanulate, or subrotate, white or greenish white. Stamens inserted in the throat or towards the base of the corolla-tube opposite its lobes; filaments short, subulate or filiform, enlarged into a broad connective; anthers ovate or triangular, attached on the back, extrorse or rarely partly introrse, two-celled, the cells spreading below, opening longitudinally. Ovary usually five or rarely six to ten-celled, villose, contracted into a glabrous short or elongated style crowned by a five-lobed stigma; ovules solitary, attached below the middle of the cell to an axile placenta projected from its interior angle, ascending, anatropous; raphe ventral; micropyle inferior. Fruit globose, ovoid or oblong, apiculate, fleshy or coriaceous, usually one or few-seeded by the abortion of several of the ovules. Seeds ovoid, terete when solitary, or compressed by mutual pressure when more than one; testa coriaceous, dull or lustrous; hilum subbasilar, elongated, conspicuous. Embryo erect, surrounded by more or less abundant fleshy albumen; cotyledons oblong, foliaceous or fleshy; radicle terete, inferior.

Chrysophyllum, a tropical genus with fifty or sixty species, is principally confined to the New World, where it is distributed from southern Florida, where one species is found, to Brazil [1] and Peru,[2] although it also occurs with a small number of species in western and southern tropical Africa,[3] southern Asia,[4] Australia,[5] and the Sandwich Islands.[6]

[1] Miquel, *Martius Fl. Brasil.* vii. 87.

[2] Ruiz & Pavon, *Fl. Peruv.* ii. 47 (*Nycterisition*).

[3] Sonder, *Linnæa*, xxiii. 72. — Oliver, *Fl. Trop. Afr.* iii. 498.

[4] Miquel, *Fl. Ind. Bat.* Suppl. 578. — Hooker f. *Fl. Brit. Ind.* iii. 535.

[5] Bentham, *Fl. Austral.* iv. 278.

[6] Hillebrand, *Fl. Haw. Is.* 277.

The most valuable species of the genus, *Chrysophyllum Cainito*,[1] a native of the West Indies and now cultivated in all tropical countries and widely naturalized in many parts of Central and South America, produces the so-called star-apple, a succulent edible blue or purple and green fruit of the size and shape of a small apple, which owes its name to the seven to ten large cells regularly arranged around the centre and presenting the appearance of a star when the fruit is cut open transversely. The fruit of several of the South American species is edible,[2] although none are so good as the star-apple, which contains less of the milky juice peculiar to many plants of this family. In India the dried fruit of *Chrysophyllum Roxburghii*[3] is eaten by the inhabitants of Khasia. Several of the species produce hard handsome and valuable wood. The large leaves, green and shining on the upper surface, and resplendent on the lower with golden or copper-colored pubescence, make many of the American species desirable ornamental trees for the decoration of gardens.

The generic name, from χρυσός and φύλλον, alludes to the golden covering of the under surface of the leaves.

[1] Linnæus, *Spec.* 192 (excl. var. β.) (1753). — Jacquin, *Hist. Stirp. Am.* 51, t. 37, f. 1; *Hist. Select. Stirp. Am.* 30, t. 51. — Descourtilz, *Fl. Méd. Antill.* ii. 13, t. 70. — Humboldt, Bonpland & Kunth, *Nov. Gen. et Spec.* iii. 236. — Maycock, *Fl. Barb.* 108. — *Bot. Mag.* lviii. t. 3072. — A. de Candolle, *Prodr.* viii. 157. — Grisebach, *Fl. Brit. W. Ind.* 398. — Miquel, *Martius Fl. Brasil.* vii. 94. — Gray, *Syn. Fl. N. Am.* ii. 67. *Cainito pomiferum*, Tussac, *Fl. Antill.* iii. 41, t. 9 (1824).

[2] Martius, *Fl. Brasil.* vii. 113.

[3] Don, *Gen. Syst.* iv. 33 (1838). — A. de Candolle, *l. c.* 162. — Kurz, *Forest Fl. Brit. Burm.* ii. 118. — Hooker f. *Fl. Brit. Ind.* iii. 535.

CHRYSOPHYLLUM OLIVIFORME.

FRUIT ovoid or subglobose, dark purple, 1-seeded. Leaves covered on the lower surface with lustrous copper-colored pubescence.

Chrysophyllum oliviforme, Lamarck, *Dict.* i. 552 (1783); *Ill.* ii. 44. — A. de Candolle, *Prodr.* viii. 158. — Gray, *Syn. Fl. N. Am.* ii. 67. — Chapman, *Fl.* ed. 2, Suppl. 634. — Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix. 100.

Chrysophyllum Cainito, Miller, *Dict.* ed. 8, No. 1 (not Linnæus) (1768).

Chrysophyllum monopyrenum, Swartz, *Prodr.* 49 (1788); *Fl. Ind. Occ.* i. 480. — Willdenow, *Spec.* i. pt. ii. 1083. — Persoon, *Syn.* i. 236. — Lunan, *Hort. Jam.* i. 259. — Roemer & Schultes, *Syst.* iv. 703. — Sprengel, *Syst.* i. 666. — *Bot. Mag.* lxi. t. 3303. — Don, *Gen. Syst.* iv. 32. — Dietrich, *Syn.* i. 638. — Miquel, *Martius Fl. Brasil.* vii. 94 (excl. var. *microphyllum*).

Chrysophyllum ferrugineum, Gærtner f. *Fruct.* iii. 122, t. 202 (1805).

Chrysophyllum oliviforme, var. **monopyrenum**, Grisebach, *Fl. Brit. W. Ind.* 398 (1864); *Cat. Pl. Cub.* 163.

Chrysophyllum microphyllum, Chapman, *Bot. Gazette*, iii. 9 (not A. de Candolle) (1878).

A tree, twenty-five to thirty feet in height, with a tall straight trunk sometimes a foot in diameter, upright branches which form a compact oblong head, and slender terete slightly zigzag branchlets. The bark of the trunk is a quarter of an inch thick, light brown slightly tinged with red, and broken by shallow fissures into large irregularly shaped plates, the surface of which separates into small thin scales. The branchlets, when they first appear, are coated with ferrugineous tomentum, and in their second year are light red-brown or ashy gray and covered with small pale elevated circular lenticels. The leaves are revolute in vernation, oval, acute or contracted into short broad points or sometimes rounded at the apex, and abruptly wedge-shaped at the base; they are thick and coriaceous, two or three inches long and an inch and a half or two inches wide, bright blue-green on the upper surface, and covered on the lower and on the stout petioles with brilliant copper-colored pubescence; they have broad prominent midribs deeply impressed on the upper side and numerous straight veins arcuate near the margins, and are borne on petioles which vary from one half to two thirds of an inch in length. The flowers are raised on stout pedicels shorter than the petioles and covered like the calyx with rufous tomentum, and produced in few or many-flowered fascicles in the axils of leaves of the year, or at the base of lateral branchlets in those of the previous year. The calyx is divided nearly to the base into broad rounded lobes and is rather shorter than the tube of the subrotate white corolla, the short spreading lobes of which are rounded at the apex. The ovary is five-celled and pubescent, and is gradually contracted into a short style crowned by a broad five-lobed stigma. In Florida the flowers appear irregularly throughout the year, and are often found on the same branch with ripe or half-grown fruit. The fruit, which is ovoid or sometimes nearly globose, dark purple and roughened with occasional excrescences, hangs gracefully on stems an inch long, usually only a single fruit being produced from a cluster of flowers. It is covered with a thick tough skin inclosing the juicy sweet mawkishly flavored flesh, and is light purple on the exterior, lighter towards the interior, and quite white in the centre; it is usually only one-seeded by abortion, the seed, which is half an inch long, narrowed at both ends, and covered with a thin light brown coat, being closely invested with a white glutinous aril-like pulpy mass.

In Florida, where it is always local and nowhere common, *Chrysophyllum oliviforme* is found on the east coast from Mosquito Inlet to the southern keys, and on the west coast from the shores of the Caloosa River to Cape Sable. It also inhabits the Bahamas[1] and many of the West Indian islands.[2]

[1] Hitchcock, *Rep. Missouri Bot. Gard.* iv. 104.

[2] Descourtilz, *Fl. Méd. Antill.* ii. 17, t. 171. — Grisebach, *Fl. Brit. W. Ind.* 398; *Cat. Pl. Cub.* 163.

The wood of *Chrysophyllum oliviforme* is very heavy, hard, strong, and close-grained, containing numerous inconspicuous medullary rays, and is light brown shaded with red, with thin lighter colored sapwood. The specific gravity of the absolutely dry wood is 0.9360, a cubic foot weighing 58.33 pounds.

Chrysophyllum oliviforme appears to have been first distinguished by Plumier, who described it in his *Nova Plantarum Americanarum Genera*,[1] published in 1703; it was first noticed in Florida by Dr. A. P. Garber.[2]

[1] *Cainito folio subtus aureo, fructu olivæ-formi*, 10; *Pl. Am.* ed. Burmann, 57, t. 69.

Chrysophyllum fructu minori glabro, foliis subtus ferrugineis. The Damson Plumb, Browne, *Nat. Hist. Jam.* 171.

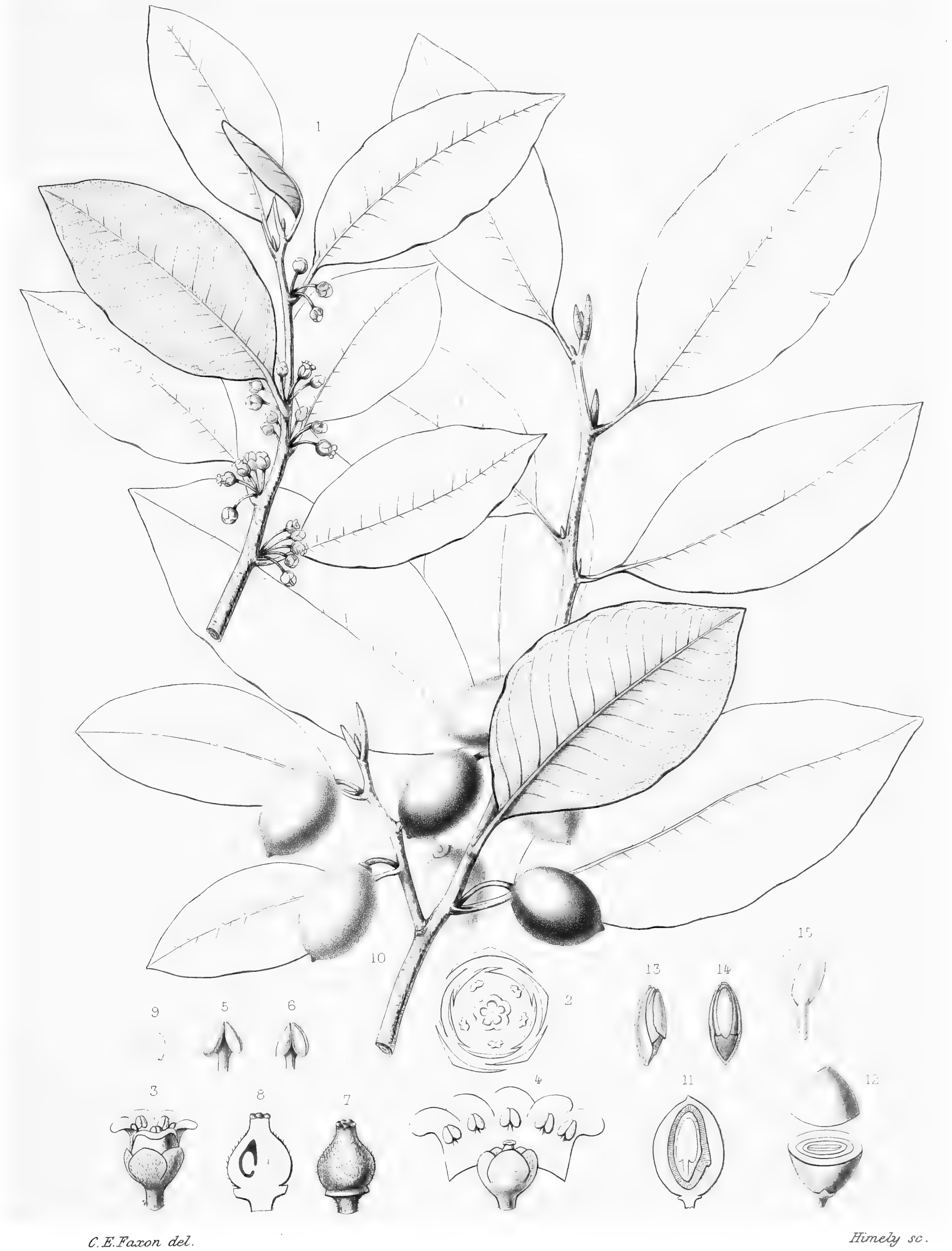
Chrysophyllum sylvestre, foliis majis aureis fructu minimo subnigro, Pouppé Desportes, *Histoire des Maladies de S. Domingue*, iii. 240.

[2] See i. 65.

EXPLANATION OF THE PLATE.

PLATE CCXLIII. CHRYSOPHYLLUM OLIVIFORME.

1. A flowering branch, natural size.
2. Diagram of a flower.
3. A flower, enlarged.
4. A flower, the corolla displayed, enlarged.
5. Rear view of a stamen, enlarged.
6. Front view of a stamen, enlarged.
7. An ovary, enlarged.
8. Vertical section of an ovary, enlarged.
9. An ovule, much magnified.
10. A fruiting branch, natural size.
11. Vertical section of a fruit, natural size.
12. A fruit cut transversely, natural size.
13. Side view of a seed, natural size.
14. Front view of a seed, natural size.
15. An embryo, magnified.



C.E.Faxon del.

Himely sc.

CHRYSOPHYLLUM OLIVIFORME, Lam.

A.Riocreux direx.t

Imp.R.Taneur, Paris.

SIDEROXYLUM.

Flowers perfect; calyx 5 or rarely 6-parted, the divisions imbricated in æstivation, persistent; corolla gamopetalous, furnished with 5 or 6 staminodia, 5 or rarely 6-lobed, the lobes imbricated in æstivation; stamens 5 or 6; disk 0; ovary superior, 5 or rarely 2 to 4-celled; ovules solitary in each cell. Fruit a dry or fleshy usually 1-seeded berry. Leaves alternate, coriaceous or submembranaceous, persistent, destitute of stipules, or rarely stipulate.

Sideroxylum, Linnæus, *Gen.* 58 (1737). — Adanson, *Fam. Pl.* ii. 171. — A. L. de Jussieu, *Gen.* 151. — Meisner, *Gen.* 251. — Endlicher, *Gen.* 739. — Bentham & Hooker, *Gen.* ii. 655. — Engler & Prantl, *Pflanzenfam.* iv. pt. i. 143. — Baillon, *Hist. Pl.* xi. 277 (excl. *Argania* and *Calvaria*).

Robertia, Scopoli, *Introduct.* 154 (1777).

Spiniluma, Baillon, *Bull. Soc. Linn. Paris*, 943 (1891).

Glabrous or pubescent trees or shrubs, with naked buds. Leaves alternate, petiolate, penniveined, the veins remote, connected by reticulate veinlets, rarely approximate and obscure, or nitidous and nearly veinless, without stipules, or stipulate in some African species.[1] Flowers usually minute, sessile or pedicellate in crowded many-flowered axillary fascicles often from leafless nodes. Pedicels ebracteolate, produced from the axils of minute deciduous bracts. Calyx funnel-shaped or rotate, the divisions orbicular or ovate, obtuse or rarely acute, nearly equal, not distinctly two-ranked. Corolla hypogynous, broadly campanulate or subtubular, white or greenish white, the lobes obtuse or acute, longer than the tube. Stamens as many as the lobes of the corolla and inserted opposite them in the throat of the tube; filaments short, or elongated and bent outward at the apex; anthers ovate or lanceolate, attached on the back, two-celled, the cells opening longitudinally, at first extrorse, sometimes becoming sublateral. Staminodia linear, scale-like or petaloid, entire or dentate, inserted under the sinuses of the corolla, or in the same rank and alternately with the stamens. Ovary five or rarely two to four-celled, glabrous or villose, contracted into a subulate short or elongated simple style tipped with a minute slightly five-lobed stigma; ovules solitary, attached to an axile placenta projected from the inner angle of the cell, ascending, anatropous; raphe dorsal; micropyle inferior. Fruit ovoid or globose, small, with a thin coriaceous pericarp, or large, globose, with thick pulpy fruit, usually one or sometimes two to five-seeded. Seed obovate or oblong; testa lustrous, light brown, thick and bony, and folded on the inner face into two obscure lobes rounded at the apex; hilum elevated, subbasilar or lateral, oblong or linear. Embryo erect in thick fleshy albumen; radicle terete, short or elongated, turned towards the hilum, much shorter than the oblong fleshy cotyledons.

Sideroxylum, with about sixty species, is widely distributed through the tropics of the two hemispheres;[2] it occurs also in Australia,[3] one species reaches the shores and islands of southern Florida, and the floras of Madeira,[4] southern Africa,[5] New Zealand,[6] and Norfolk Island each include a single species.

[1] Oliver, *Fl. Trop. Afr.* iii. 501.

[2] A. de Candolle, *Prodr.* viii. 117. — Walpers, *Rep.* vi. 455. — Miquel, *Fl. Ind. Bat.* ii. 1036; Suppl. 580; *Martius Fl. Brasil.* vii. 48. — Bentham, *Fl. Hongk.* 209. — Oliver, *l. c.* — Grisebach, *Fl. Brit. W. Ind.* 399. — Baker, *Fl. Maur. and Seych.* 192. — Hemsley, *Bot. Biol. Am. Cent.* ii. 296. — Hooker f. *Fl. Brit. Ind.* iii. 536. — Hillebrand, *Fl. Haw. Is.* 276. — Forbes & Hemsley, *Jour. Linn. Soc.* xxvi. 68.

[3] Bentham, *Fl. Austral.* iv. 280 (Achras).

[4] *Sideroxylum Mermulana*, Lowe, *Trans. Camb. Phil. Soc.* iv. 22 (1831); *Man. Fl. Mad.* ii. 18. — A. de Candolle, *l. c.* 181.

[5] *Sideroxylum inerme*, Linnæus, *Spec.* 192 (1753). — Jacquin, *Coll.* ii. 250. — Willdenow, *Spec.* i. pt. ii. 1089. — Lamarck, *Ill.* ii. 41, t. 120, f. 1. — A. de Candolle, *l. c.* 182. — Pappe, *Sylva Capensis*, 22.

[6] *Sideroxylum costatum*, F. Mueller, *Cens. Austral. Pl.* pt. i. 92 (1882). — Kirk, *Forest Fl. New Zealand*, 277, t. 133.

Achras costata, Endlicher, *Prodr. Fl. Norf.* 49 (1833); *Icon. Gen. Pl.* t. 83.

Sapota costata, A. de Candolle, *l. c.* 175 (1844).

Several species of Sideroxylum are large and valuable timber-trees, producing hard handsome durable wood. The sweet fruits of *Sideroxylum dulcificum*,[1] the Miraculous Berry of the English colonists on the west coast of Africa, are eaten to counteract acidity, and are an article of trade among the natives.[2] From the milky sap of *Sideroxylum attenuatum*,[3] a native of southeastern Asia from Burmah to the Philippine Islands, gutta-percha of inferior quality is obtained,[4] and the sap of other species is probably utilized in the same way.

The generic name, from σίδηρος and ξύλον, relates to the hardness of the wood produced by the different species of this genus.

[1] A. de Candolle, *Prodr.* viii. 183 (1844). — Oliver, *Fl. Trop. Afr.* iii. 503.

Bumelia dulcifica, Schumacher, *Dansk. Vidensk. Selsk. Skrift.* iii. 150 (*Guin. Pl.*) (1828).

[2] *Treasury of Botany*, 1057.

[3] A. de Candolle, *l. c.* 178 (1844). — Miquel, *Fl. Ind. Bat.* ii. 1036. — Kurz, *Forest Fl. Brit. Burm.* ii. 117.

[4] Spons, *Encyclopædia of the Industrial Arts, Manufactures, and Raw Commercial Products*, ii. 1627, 1652.

SIDEROXYLUM MASTICHODENDRON.

Mastic.

FLOWERS in crowded fascicles shorter than the petioles. Fruit oblong, pulpy, 1-seeded. Leaves oval, long-petiolate.

Sideroxylum Mastichodendron, Jacquin, *Coll.* ii. 253, t. 17, f. 5 (1788). — Lamarck, *Ill.* ii. 41, t. 120, f. 2. — Gærtner f. *Fruct.* iii. 125. — Sprengel, *Syst.* i. 666. — Dietrich, *Syn.* i. 622. — A. de Candolle, *Prodr.* viii. 181. — Grisebach, *Fl. Brit. W. Ind.* 399. — Gray, *Syn. Fl. N. Am.* ii. 67. — Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix. 101.

Bumelia pallida, Swartz, *Prodr.* 49 (1788); *Fl. Ind. Occ.* i. 489. — Willdenow, *Spec.* i. pt. ii. 1085. — Lunan, *Hort. Jam.* i. 58.

Bumelia salicifolia, Willdenow, *Spec.* i. pt. ii. 1086 (in part) (1797).

Achras pallida, Poiret, *Lam. Dict.* vi. 533 (1804).

Bumelia Mastichodendron, Roemer & Schultes, *Syst.* iv. 493 (1819). — Don, *Gen. Syst.* iv. 29. — Cooper, *Smithsonian Rep.* 1860, 439.

Sideroxylum pallidum, Sprengel, *Syst.* i. 666 (1825). — A. de Candolle, *Prodr.* viii. 180. — A. Richard, *Fl. Cub.* iii. 84. — Chapman, *Fl.* 274.

Bumelia fœtidissima, Nuttall, *Sylva*, iii. 39, t. 94 (excl. syn.) (not Willdenow) (1849). — Cooper, *Smithsonian Rep.* 1858, 265.

A tree, in Florida sixty or seventy feet in height, with a massive straight trunk three or four feet in diameter, stout upright branches which form a dense irregular head, thick terete branchlets, and naked buds. The bark of the trunk varies from one third to one half of an inch in thickness and from a dark gray color to a light brown tinged with red, and is broken into thick plate-like scales which separate in thin plates. The branchlets, when they first appear, are orange-colored and slightly puberulous, later becoming light red to ashy gray and quite glabrous, and in the second year they are brown more or less tinged with red, marked with the conspicuous nearly orbicular leaf-scars, displaying three large fibro-vascular bundle-scars, and conspicuously roughened by the thickened persistent bases of the fruit-stalks. The leaves are oval, acute at the apex, or rounded and then occasionally slightly emarginate, and acute at the base, with thickened cartilaginous slightly undulate margins; when they unfold they are silky-canescent on the lower surface, and at maturity are thin and firm, glabrous, bright green and lustrous above, lustrous and yellow-green below, three to five inches long and an inch and a half to two inches broad, with broad pale conspicuous midribs deeply impressed on the upper side and inconspicuous primary veins arcuate near the margins and connected by prominent reticulate veinlets; they are borne on slender pale petioles an inch to an inch and a half in length, and are mostly clustered near the ends of the branches, and, unfolding irregularly from early spring until autumn, fall at the close of the year. The flowers usually appear in Florida in the autumn, but also open in early spring and during the summer; they are five-parted, produced in many-flowered clusters from the axils of young leaves or on the branches of the previous year from leafless nodes, and are borne on stout orange-colored puberulous pedicels developed from the axils of minute acute scarious bracts which usually fall before the opening of the flower-buds. The calyx is yellow-green, puberulous on the outer surface and deeply divided into broadly ovate rounded lobes rather shorter than the light yellow corolla, the divisions of which are ovate-oblong and rounded. The staminodia are lanceolate, nearly entire, tipped with subulate points, and much shorter than the stamens, which have elongated filaments and lanceolate anthers. The ovary is oblong-ovate, glabrous, and gradually contracted into an elongated style, stigmatic at the apex. Usually only one flower in a fascicle produces a fruit; it develops in about six months, in Florida the principal crop ripening through April and May. The fruit, which is one-seeded, oblong, surrounded at the base by the persistent calyx, apiculate at the apex with the remnants of the style, and an inch

long, has a thick tough clear yellow skin and thin dry flesh of a pleasant subacid flavor; it stands erect or nearly at right angles to the branch on a much thickened woody stem, and in falling separates from the calyx. The seed is obovate, rounded above, narrowed at the base, half an inch long and a third of an inch broad. Produced in great profusion, the fruit of the Mastic is an important article of food for many birds and animals, who devour it eagerly.

In the United States *Sideroxylum Mastichodendron* inhabits southern Florida, where it is distributed on the eastern coast from Cape Canaveral to the southern keys and on the western coast from Cape Romano to Cape Sable, usually growing on rich hummocks; on the keys it is found with the Gumbo Limbo, the Marlberry, the Bustic, the Black Calabash, the Ironwood, the Pigeon Plum, and the Eugenias, and on the mainland with the Live Oak, the Palmetto, the Mulberry, and the Cuban Pine. It is also common on the Bahamas and on many of the West Indian islands.

The wood of *Sideroxylum Mastichodendron* is very heavy, exceedingly hard, strong, and close-grained; it contains small scattered open ducts and numerous inconspicuous medullary rays, and is bright orange-colored, with thick yellow sapwood composed of forty or fifty layers of annual growth. The specific gravity of the absolutely dry wood is 1.0109, a cubic foot weighing 63.00 pounds. It is not injured by the teredo, and in southern Florida is largely used in ship and boat building.

Sideroxylum Mastichodendron was first distinguished by Catesby, who found it in the Bahama Islands, and in 1743 published the earliest description of it in the second volume of his *Natural History of Carolina*.[1] It was discovered in Florida on Key West by Dr. J. L. Blodgett.

The Mastic is the largest, the most valuable, and one of the most beautiful of the tropical trees which inhabit the coast of Florida; and no other North American tree which equals it in size produces such heavy wood.

[1] *Cornus, foliis Laurinis, fructu majore luteo*, ii. 75, t. 75.

EXPLANATION OF THE PLATES.

PLATE CCXLIV. SIDEROXYLUM MASTICHODENDRON.

1. A flowering branch, natural size.
2. Diagram of a flower.
3. A flower, enlarged.
4. A flower, the corolla displayed, enlarged.
5. A stamen, enlarged.
6. Vertical section of a flower, the corolla removed, enlarged.
7. An ovule, much magnified.

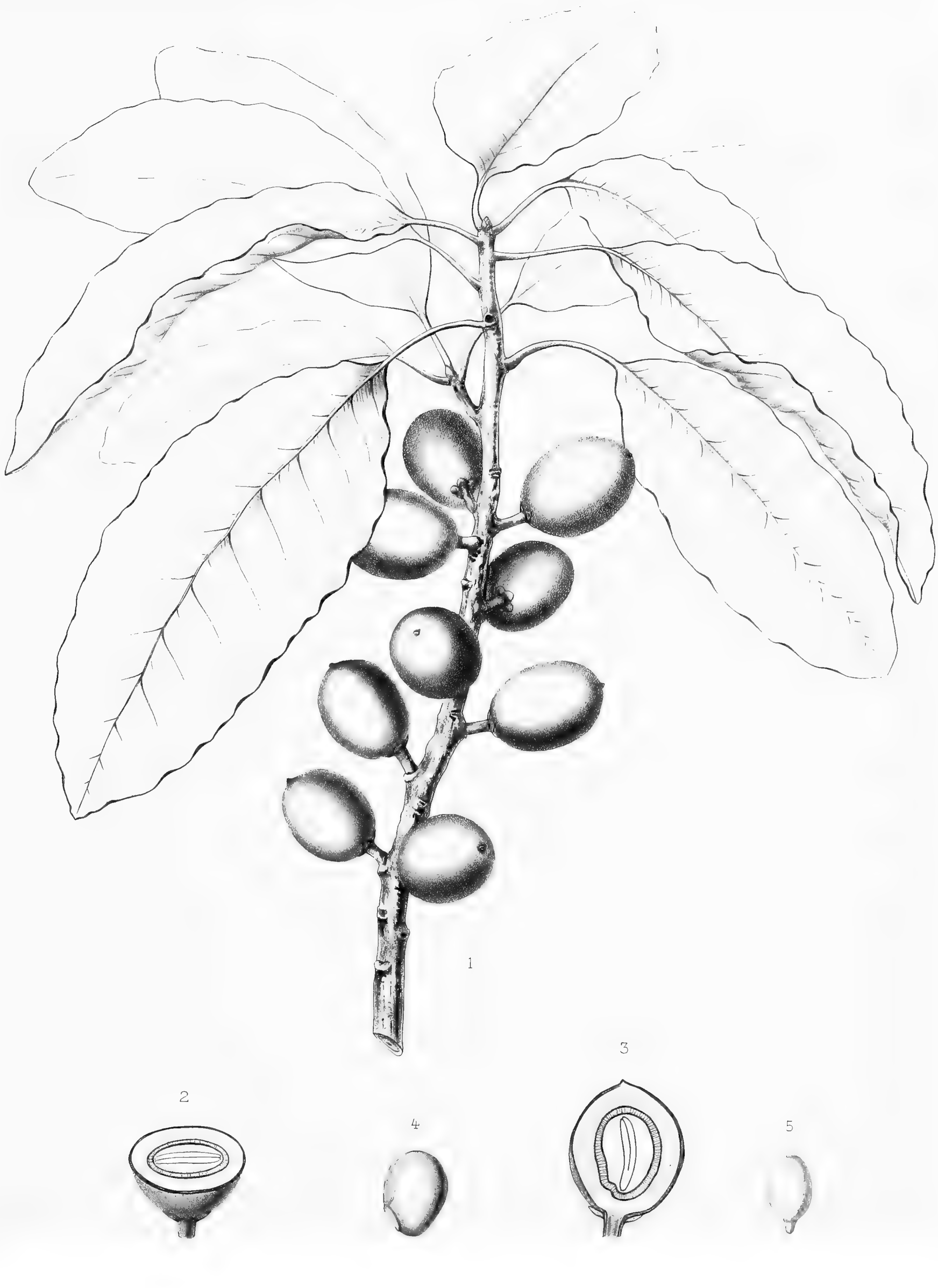
PLATE CCXLV. SIDEROXYLUM MASTICHODENDRON.

1. A fruiting branch, natural size.
2. Cross section of a fruit, slightly enlarged.
3. Vertical section of a fruit, slightly enlarged.
4. A seed, slightly enlarged.
5. An embryo, slightly enlarged.

C.E. Faxon del. Rapine sc.

SIDEROXYLUM MASTICHODENDRON, Jacq.

A. Riocreux direx.t Imp. R. Taneur, Paris



C.E.Faxon del. *Himely sc.*

SIDEROXYLUM MASTICHODENDRON, Jacq.

A.Riocreux direx.t *Imp. R.Taneur, Paris.*

BUMELIA.

FLOWERS perfect; calyx 5 or 6-lobed, the lobes imbricated in æstivation, persistent; corolla gamopetalous, 5-lobed, the lobes furnished with petal-like appendages and staminodia, imbricated in æstivation; stamens 5; disk 0; ovary superior, 5-celled; ovules solitary, ascending. Fruit a fleshy 1-seeded berry; seed exalbuminous. Leaves alternate, membranaceous or coriaceous, destitute of stipules.

Bumelia, Swartz, *Prodr.* 49 (1788). — Meisner, *Gen.* 251. — Endlicher, *Gen.* 740 (excl. *Rostellaria*). — Bentham & Hooker, *Gen.* ii. 660. — Radlkofer, *Sitz. Math.-Phys. Cl. Acad. Münch.* xiv. pt. iii. 465. — Engler & Prantl, *Pflanzenfam.* iv. pt. i. 145. — Baillon, *Hist. Pl.* xi. 277 (excl. *Dipholis*).

Sclerocladus, Rafinesque, *Sylva Tellur.* 35 (1838).

Small trees or shrubs, with hard close-grained wood, terete often spinescent glabrous or tomentose branches with short spur-like lateral branchlets, scaly buds, and fibrous roots. Leaves alternate, often fascicled on the spur-like lateral branchlets, conduplicate in vernation, coriaceous or membranaceous, short-petiolate, small, obovate, obtuse, or sometimes larger and elliptical, clothed on the lower surface with silky or tomentose pubescence, or glabrous or nearly so, penniveined with rather inconspicuous veins arcuate near the entire margins and conspicuous reticulate veinlets, deciduous or persistent. Flowers small, pedicellate, in many-flowered crowded fascicles in the axils of existing leaves or from leafless nodes of previous years. Pedicels slender, clavate, ebracteolate, produced from the axils of lanceolate acute scarious deciduous bracts. Calyx ovate to subcampanulate, tomentose or glabrous, five-lobed, the lobes in one series, ovate or oblong, rounded at the apex, nearly equal. Corolla hypogynous, campanulate, short-tubed, white, with spreading broadly ovate lobes rounded at the apex and furnished on each side at the base with an acute ovate or lanceolate petaloid appendage. Stamens five, inserted in the throat of the tube of the corolla opposite its lobes; filaments filiform, short or elongated; anthers ovate-sagittate, attached on the back below the middle, two-celled, the cells opening longitudinally by subextrorse slits. Staminodia petal-like, ovate or ovate-lanceolate, entire or obscurely denticulate, complanate or keeled on the back, sometimes furnished at the base with a pair of minute scales, inserted in the same rank and alternately with the stamens. Ovary hirsute, ovate to ovate-conical, gradually or abruptly contracted into a slender short or elongated simple style stigmatic at the acute apex; ovules solitary, attached by the base to an axile placenta projected from the inner angle of the cell, ascending, anatropous; raphe dorsal; micropyle inferior. Fruit an oblong obovate or globose black one-seeded berry tipped with the remnants of the persistent style and inclosed at the base by the calyx, solitary or in two or three-fruited clusters; pericarp thin and fleshy. Seed ovate or oblong, apiculate or rounded at the apex, destitute of albumen; testa thick, crustaceous, light brown, smooth and shining, folded more or less conspicuously on the back into two lobes rounded at the apex. Embryo filling the cavity of the seed; cotyledons thick and fleshy, hemispherical, usually consolidated; radicle terete, very short, turned toward the basilar or subbasilar, orbicular, or elliptical hilum.

Bumelia, with about twenty species,[1] is confined to the New World, where it is distributed from the southern United States through the West Indies to Mexico, Central America, and Brazil. Five

[1] A. de Candolle, *Prodr.* viii. 189. — Grisebach, *Fl. Brit. W. Ind.* 401. — Miquel, *Martius Fl. Brasil.* vii. 46. — Gray, *Syn. Fl. N. Am.* ed. 2, ii. 67. — Hemsley, *Bot. Biol. Am. Cent.* ii. 297. — Engler, *Bot. Jahrb.* xii. 519.

species inhabit the United States; of these four are small trees and the fifth is a low shrub[1] of the south Atlantic coast region.

Bumelia produces hard heavy strong wood which in the North American species contains bands of numerous large open ducts which define the layers of annual growth and are connected by conspicuous branched groups of similar ducts presenting in cross-section a handsome reticulate appearance. It is not known to possess other valuable properties.

The generic name is formed from *βουμελία*, the ancient classical name of an Ash-tree.

[1] *Bumelia reclinata*, Ventenat, *Choix*, t. 22 (1803). — Persoon, *Syn.* i. 237. — Pursh, *Fl. Am. Sept.* i. 155. — Roemer & Schultes, *Syst.* iv. 496. — Elliott, *Sk.* i. 287. — Dietrich, *Syn.* i. 621. — Don, *Gen. Syst.* iv. 30. — Loudon, *Arb. Brit.* ii. 1193. — A. de Candolle, *Prodr.* viii. 190. — Chapman, *Fl.* 275. — Gray, *Syn. Fl. N. Am.* ed. 2, ii. 68. *Sideroxylon reclinatum*, Michaux, *Fl. Bor.-Am.* i. 122 (1803). — Du Mont de Courset, *Bot. Cult.* ed. 2, iii. 302. *Bumelia lycioides*, var. *reclinata*, Gray, *Syn. Fl. N. Am* ii. 68 (1878). — Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix. 103.

SYNOPSIS OF THE NORTH AMERICAN ARBORESCENT SPECIES.

Pedicels and calyx clothed with silky or tomentose pubescence. Leaves silky or tomentose-pubescent on the lower surface, venulose-reticulate on the upper.

Leaves oblanceolate or spatulate-cuneate, coated on the lower surface with golden or ferruginous pubescence . . . . . 1. B. TENAX.

Leaves oblong-obovate or cuneate-obovate, silky-pubescent on the lower surface . . . . . 2. B. LANUGINOSA.

Pedicels and calyx glabrous. Leaves glabrous or nearly so.

Leaves oblanceolate to obovate-oblong, finely venulose-reticulate, thin . . . . . 3. B. LYCIOIDES.

Leaves spatulate or linear-oblanceolate to broadly obovate-cuneate, obtuse, coriaceous, obscurely venulose-reticulate . . . . . 4. B. ANGUSTIFOLIA.

BUMELIA TENAX.

Ironwood.

LEAVES oblanceolate or spatulate to cuneate-obovate, obtuse, coated on the lower surface with golden or ferrugineous pubescence.

Bumelia tenax, Willdenow, *Spec.* i. pt. ii. 1085 (1797); *Enum.* 248; *Berl. Baumz.* ed. 2, 67. — Aiton, *Hort. Kew.* ed. 2, ii. 12. — Persoon, *Syn.* i. 237. — Roemer & Schultes, *Syst.* iv. 496. — Elliott, *Sk.* i. 288. — Hayne, *Dendr. Fl.* 18. — Sprengel, *Syst.* i. 665. — Don, *Gen. Syst.* iv. 30. — Dietrich, *Syn.* i. 621. — Spach, *Hist. Vég.* ix. 388. — Nuttall, *Sylva*, iii. 35, t. 92. — A. de Candolle, *Prodr.* viii. 189. — Chapman, *Fl.* 275. — Gray, *Syn. Fl. N. Am.* ii. 68. — Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix. 101.

Sideroxylon tenax, Linnæus, *Mant.* 48 (1767). — Jacquin, *Coll.* ii. 252. — Lamarck, *Dict.* i. 245; *Ill.* ii. 42. — Swartz, *Obs.* 92. — Desfontaines, *Hist. Arb.* i. 204. — Du Mont de Courset, *Bot. Cult.* ed. 2, iii. 300.

Chrysophyllum Carolinense, Jacquin, *Obs.* iii. 3, t. 54 (1768).

Sideroxylon sericeum, Walter, *Fl. Car.* 100 (1788).

Sideroxylon chrysophylloides, Michaux, *Fl. Bor.-Am.* i. 123 (1803).

Bumelia chrysophylloides, Pursh, *Fl. Am. Sept.* i. 155 (1814). — Nuttall, *Gen.* i. 135. — Watson, *Dendr. Brit.* i. 10, t. 10. — Rafinesque, *Fl. Ludovic.* 53.

Sclerocladus tenax, Rafinesque, *Sylva Tellur.* 35 (1838).

Sclerozus tenax, Rafinesque, *Aut. Bot.* 73 (1840).

A tree, twenty to thirty feet in height, with a trunk occasionally five or six inches in diameter, and straight spreading flexible tough branches unarmed or armed with straight stout rigid spines sometimes half an inch long. The bark of the trunk is thick, brown tinged with red, and divided irregularly by deep fissures into narrow flat reticulate ridges covered with minute appressed scales. The branchlets, when they first appear, are coated with silky pale pubescence often tinged with red, which soon becomes rusty brown and disappears before winter, when they are dark red and slightly roughened with occasional minute dark lenticels. The winter-buds are minute, subglobose, and covered by imbricated ovate scales, rounded at the apex and clothed with rusty brown tomentum. The leaves vary from oblanceolate-spatulate to cuneate-obovate, and are rounded or acute and sometimes apiculate or emarginate at the apex and wedge-shaped at the base; when they unfold they are coated with thick pale or light red silky pubescence, and at maturity are thin and firm, dark dull green, glabrous, finely venulose-reticulate on the upper surface, coated on the lower with soft silky golden ferrugineous pubescence, one to three inches in length and one half to two thirds of an inch in breadth, with prominent midribs deeply impressed on the upper side; they are borne on slender hairy grooved petioles half an inch long, and turn yellow and fall irregularly during the winter. The flowers, which appear from May in Florida to July in North Carolina, are produced in many-flowered crowded fascicles from buds which at their first appearance in the axils of the young leaves are coated with bright red pubescence; they are an eighth of an inch long, and are borne on pedicels an inch in length and coated with rufous silky pubescence, as is also the narrowly ovate calyx with its oblong lobes. The appendages of the corolla are ovate, acute, crenate, and shorter than the ovate staminodia, which are about equal to the lobes of the corolla in length. The ovary is narrowly ovate and gradually contracted into an elongated style. The fruit ripens and falls in the autumn; it is oblong and varies from a third to half an inch in length.

Bumelia tenax grows in dry sandy soil in the neighborhood of the coast and is distributed from North Carolina to Cape Canaveral and Cedar Keys, Florida.

The wood of *Bumelia tenax* is heavy, hard, close-grained, and susceptible of receiving a beautiful polish; it contains numerous thin medullary rays and is light brown streaked with white, with lighter colored sapwood. The specific gravity of the absolutely dry wood is 0.7293, a cubic foot weighing 45.45 pounds.

Bumelia tenax appears to have been discovered in South Carolina by Dr. Alexander Garden,[1] who sent it to Linnæus; according to Aiton,[2] it was introduced into England in 1765. Occasionally found in European gardens in the early years of this century, it has probably now disappeared from cultivation.

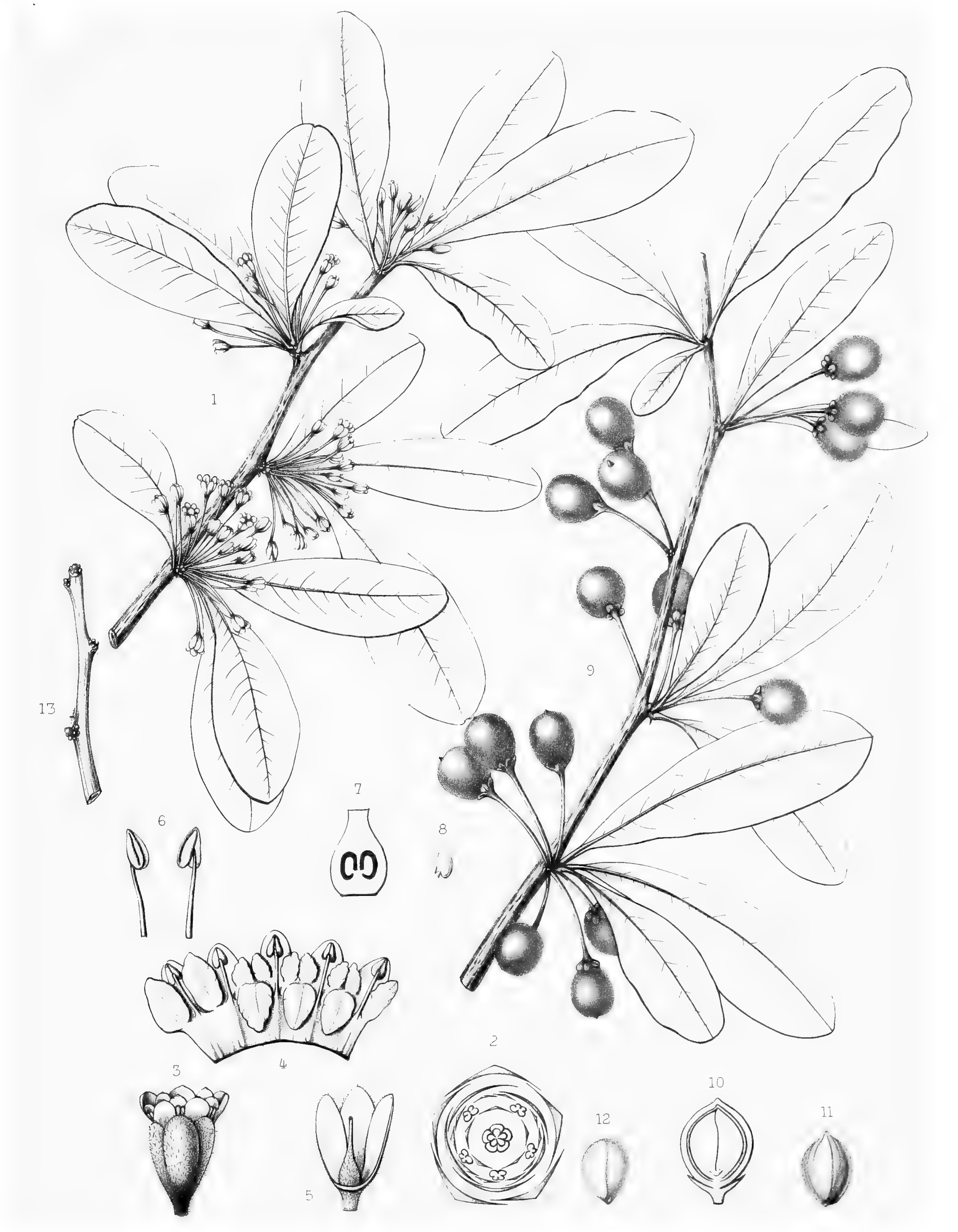
[1] See i. 40.

[2] Aiton, *Hort. Kew.* i. 262 (Sideroxylon). — Loudon, *Arb. Brit.* ii. 1193, f. 1017.

EXPLANATION OF THE PLATE.

PLATE CCXLVI. BUMELIA TENAX.

1. A flowering branch, natural size.
2. Diagram of a flower.
3. A flower, enlarged.
4. A corolla displayed, enlarged.
5. A flower, two of the calyx-lobes and the corolla removed, enlarged.
6. A stamen, side views, enlarged.
7. Vertical section of an ovary, enlarged.
8. An ovule, much magnified.
9. A fruiting branch, natural size.
10. Vertical section of a fruit, enlarged.
11. A seed, enlarged.
12. An embryo, enlarged.
13. A winter branchlet, natural size.



C.E. Faxon del. Toulet sc.

BUMELIA TENAX, Willd.

A. Riocreux direx.t Imp. R. Taneur, Paris.

BUMELIA LANUGINOSA.

Gum Elastic. Chittim Wood.

LEAVES oblong-obovate to cuneate-obovate, silky-pubescent on the lower surface.

Bumelia lanuginosa, Persoon, *Syn.* i. 237 (1805). — Pursh, *Fl. Am. Sept.* i. 155. — Nuttall, *Gen.* i. 135. — Roemer & Schultes, *Syst.* iv. 497. — Elliott, *Sk.* i. 288. — Don, *Gen. Syst.* iv. 30. — A. de Candolle, *Prodr.* viii. 190. — Chapman, *Fl.* 275. — Gray, *Syn. Fl. N. Am.* ii. 68. — Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix. 102. — Watson & Coulter, *Gray's Man.* ed. 6, 333. — Coulter, *Contrib. U. S. Nat. Herb.* ii. 256 (*Man. Pl. W. Texas*).

? Sideroxylon tenax, Walter, *Fl. Car.* 100 (not Linnæus) (1788).

Sideroxylon lanuginosum, Michaux, *Fl. Bor.-Am.* i. 122 (1803). — Du Mont de Courset, *Bot. Cult.* ed. 2, iii. 302.

Chrysophyllum Ludovicianum, Rafinesque, *Fl. Ludovic.* 53 (1817).

? Bumelia oblongifolia, Nuttall, *Gen.* i. 135 (1818); *Sylva*, iii. 33. — Sprengel, *Syst.* i. 664. — Don, *Gen. Syst.* iv. 30. — Loudon, *Arb. Brit.* ii. 1194. — Dietrich, *Syn.* i. 621. — A. de Candolle, *Prodr.* viii. 190.

Bumelia arachnoidea, Rafinesque, *New Fl.* iii. 28 (1836).

Bumelia tomentosa, A. de Candolle, *Prodr.* viii. 190 (1844).

Bumelia ferruginea, Nuttall, *Sylva*, iii. 34 (1849).

Bumelia arborea, Buckley, *Proc. Phil. Acad.* 1861, 461.

A tree, sometimes fifty or sixty feet in height, with a tall straight trunk occasionally three feet in diameter, short stout tough rigid branches, unarmed or armed with stout rigid straight or slightly curved spines which frequently develop into spinescent leafy lateral branches, and slender often somewhat zigzag branchlets, forming a narrow oblong round-topped head; or much smaller in the region east of the Mississippi River, where it rarely attains the height of twenty feet. The bark of the trunk is half an inch thick, dark gray-brown and usually divided by deep reticulate fissures into narrow ridges which are broken into thick appressed scales. The branchlets, when they first appear, are coated with thick rufous or pale tomentum, and in their first winter vary in color from red-brown to ashy gray and are glabrous or nearly so, and marked with occasional minute lenticels and with the small semiorbicular leaf-scars which display two clusters of fibro-vascular bundle-scars. The winter-buds are obtuse, an eighth of an inch long, and covered with broadly ovate scales clothed with rufous tomentum. The leaves are oblong-obovate to cuneate-obovate, rounded and often apiculate at the apex and gradually narrowed at the base; when they unfold they are coated with pale or ferrugineous tomentum, which is thick on the lower and loose on the upper surface, and at maturity they are thin and firm, dark green and lustrous above, and covered below with loose dull and usually pale tomentum, which varies greatly in amount and sometimes almost disappears. They vary from an inch to two inches and a half in length and from one third to three quarters of an inch in width, and are borne on short slender hairy petioles; they fall irregularly during the winter. The flowers are produced in summer in sixteen to eighteen-flowered fascicles on hairy pedicels and are an eighth of an inch long. The calyx is ovate, with ovate rounded lobes, coated on the outer surface with pale or ferrugineous tomentum, and rather shorter than the tube of the corolla. The staminodia are ovate, acute, remotely and slightly denticulate, and as long as the lobes of the corolla, which are furnished with ovate acute appendages. The ovary is hirsute and abruptly contracted into a slender elongated style. The fruit is oblong or slightly obovate, half an inch long, and borne on slender drooping stalks; it ripens and falls in the autumn.

Bumelia lanuginosa is distributed from southern Georgia and northern Florida to the shores of Mobile Bay, Alabama, and from southern Illinois and southern Missouri through Arkansas and Texas to the mountain slopes of Nuevo Leon. Nowhere common east of the Mississippi River, where it usually grows in dry and rather sandy soil, it is very abundant and reaches its largest size on the rich river-bottom lands of eastern Texas.

The wood of *Bumelia lanuginosa* is heavy, rather soft, not strong, close-grained, with many thin medullary rays, and is light brown or yellow, with thick lighter colored sapwood. The specific gravity of the absolutely dry wood is 0.6544, a cubic foot weighing 40.78 pounds. In Texas it is sometimes used in cabinet-making. The clear viscid gum which exudes in considerable quantities from the freshly cut wood is used domestically.

Bumelia lanuginosa was first distinguished by the French botanist Michaux, who found it in Georgia; it was introduced into cultivation early in the present century and is still occasionally found in European gardens.

In the region adjacent to the southern boundary of the United States, from western Texas and Nuevo Leon to Arizona, a form [1] occurs with more rigid spinescent branches and with thick coriaceous leaves which vary from obovate to cuneate-oblanceolate, and are rather more than an inch in length and a quarter of an inch in width; at maturity they are covered on the lower surface with sparse pale tomentum or are nearly glabrous. It is a small tree eighteen to twenty-five feet in height, with a short trunk covered with red-brown bark divided into long appressed ridge-like scales broken into minute flakes, and inhabits dry gravelly mountain slopes in the neighborhood of streams.

The wood of *Bumelia lanuginosa*, var. *rigida*, is heavy, hard, and very close-grained, with thin obscure medullary rays, and is a light rich brown or yellow, with thick lighter colored sapwood. The specific gravity of the absolutely dry wood is 0.6603, a cubic foot weighing 41.15 pounds.

[1] *Bumelia lanuginosa*, var. *rigida*, Gray, *Syn. Fl. N. Am.* ed. 2, ii. 68 (1886).

Bumelia spinosa, Watson, *Proc. Am. Acad.* xviii. 112 (not De Candolle) (1883). — Sargent, *Forest Trees N. Am. 10th Census U. S.* ix. 102.

EXPLANATION OF THE PLATE.

PLATE CCXLVII. BUMELIA LANUGINOSA.

1. Flowering branches of the typical and of the spinescent forms, natural size.
2. A flower, enlarged.
3. A flower, with the corolla displayed, enlarged.
4. Front and rear views of a stamen, enlarged.
5. A fruiting branch, natural size.
6. Vertical section of a fruit, natural size.
7. A seed, natural size.
8. An embryo, natural size.
9. A winter branchlet, natural size.

C.E.Faxon del.

Lövendal sc.

BUMELIA LANUGINOSA, Pers.

A. Riocreux direx.t

Imp. R. Taneur, Paris.

BUMELIA LYCIOIDES.

Ironwood. Buckthorn.

LEAVES oblanceolate to obovate-oblong, thin, finely venulose-reticulate.

Bumelia lycioides, Gærtner f. *Fruct.* iii. 127, t. 202 (1805). — Persoon, *Syn.* i. 237. — Willdenow, *Enum.* 249; *Berl. Baumz.* ed. 2, 68. — Pursh, *Fl. Am. Sept.* i. 155. — Nuttall, *Gen.* i. 135; *Sylva,* iii. 31, t. 91. — Roemer & Schultes, *Syst.* iv. 495. — Hayne, *Dendr. Fl.* 19. — Elliott, *Sk.* i. 287. — Sprengel, *Syst.* i. 664. — Don, *Gen. Syst.* iv. 30. — Dietrich, *Syn.* i. 621. — Spach, *Hist. Vég.* ix. 388. — A. de Candolle, *Prodr.* viii. 189. — Chapman, *Fl.* 275. — Gray, *Syn. Fl. N. Am.* ii. 68. — Hemsley, *Bot. Biol. Am. Cent.* ii. 298. — Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix. 102. — Watson & Coulter, *Gray's Man.* ed. 6, 332. — Baillon, *Hist. Pl.* xi. 255, f. 266–269. — Coulter, *Contrib. U. S. Nat. Herb.* ii. 257 (*Man. Pl. W. Texas*).

Sideroxylon lycioides, Linnæus, *Spec.* ed. 2, 279 (1762). — Wangenheim, *Nordam. Holz.* 117. — Lamarck, *Dict.* i. 246; *Ill.* ii. 42. — Willdenow, *Spec.* i. pt. ii. 1090. — Michaux, *Fl. Bor.-Am.* i. 122. — Du Mont de Courset, *Bot. Cult.* ed. 2, iii. 301. — Jaume St. Hilaire, *Flore et Pomone,* v. t. 481.

Sideroxylon decandrum, Linnæus, *Mant.* 48 (1767). — Willdenow, *Spec.* i. pt. ii. 1091.

Sideroxylon læve, Walter, *Fl. Car.* 100 (1788).

A tree, twenty-five to thirty feet in height, with a short trunk rarely more than six inches in diameter, stout flexible branches usually unarmed or furnished with short stout slightly curved spines which occasionally develop into leafy spinescent branches, and short thick spur-like lateral branchlets. The bark of the trunk is thin and light red-brown, the generally smooth surface being broken into small thin persistent scales. The branchlets, when they first appear, are slightly puberulous but soon become glabrous; in midsummer they are light red-brown, rather lustrous and marked by numerous minute pale lenticels, and in their second year are dark or light brown tinged with red, or ashy gray. The winter-buds are minute, obtuse, nearly immersed in the bark and covered with pale dark brown glabrous scales. The leaves are oblanceolate to oblong-obovate, acute and rounded at the apex, gradually narrowed at the base, bright green and glabrous on the upper surface, light green on the lower surface, which is sometimes coated at first with pale pubescence, thin and rather firm, finely venulose-reticulate, an inch and a half to four inches long and half an inch to an inch and a half broad, with pale thin conspicuous midribs and primary veins rounded on the upper side; they are borne on slender slightly grooved petioles half an inch in length and fall in the autumn. The flowers, which appear in midsummer in crowded many-flowered fascicles, are borne on slender glabrous pedicels half an inch long. The calyx is glabrous, ovate-campanulate, with rounded lobes, and rather shorter than the corolla. The staminodia are broadly ovate and denticulate. The ovary is ovate, slightly hairy toward the base only, and gradually contracted into a short thick style. The fruit, which ripens and falls in the autumn, is ovoid or obovate and about two thirds of an inch long.

Bumelia lycioides, which selects low wet soil along the borders of swamps and streams, is distributed from the coast of Virginia and southern Illinois to Mosquito Inlet and the shores of the Caloosa River in Florida, and through southern Missouri, Arkansas, and Texas to the valley of the Rio Concho.

The wood of *Bumelia lycioides* is heavy, hard, not strong, and close-grained, with numerous thin medullary rays; it is light brown or yellow, with thick lighter colored sapwood. The specific gravity of the absolutely dry wood is 0.7467, a cubic foot weighing 46.53 pounds.

The earliest account of *Bumelia lycioides*, prepared from a plant grown in the Botanic Garden at Leyden, was published by Boerhaave in 1720.[1] According to Aiton[2] it was cultivated by Philip Miller

[1] *Arbor; folio Salicis viridi, alterno, splendente; spinis longis, alternis, ad alas foliorum, Ind. Alt. Hort. Ludg. Bat.* ii. 263.

Lycioides, Linnæus, *Hort. Cliff.* 488 (excl. hab.).

Sideroxilon spinosum, foliis deciduis; sive Lycioides, Duhamel, *Traité des Arbres*, ii. 260, t. 68.

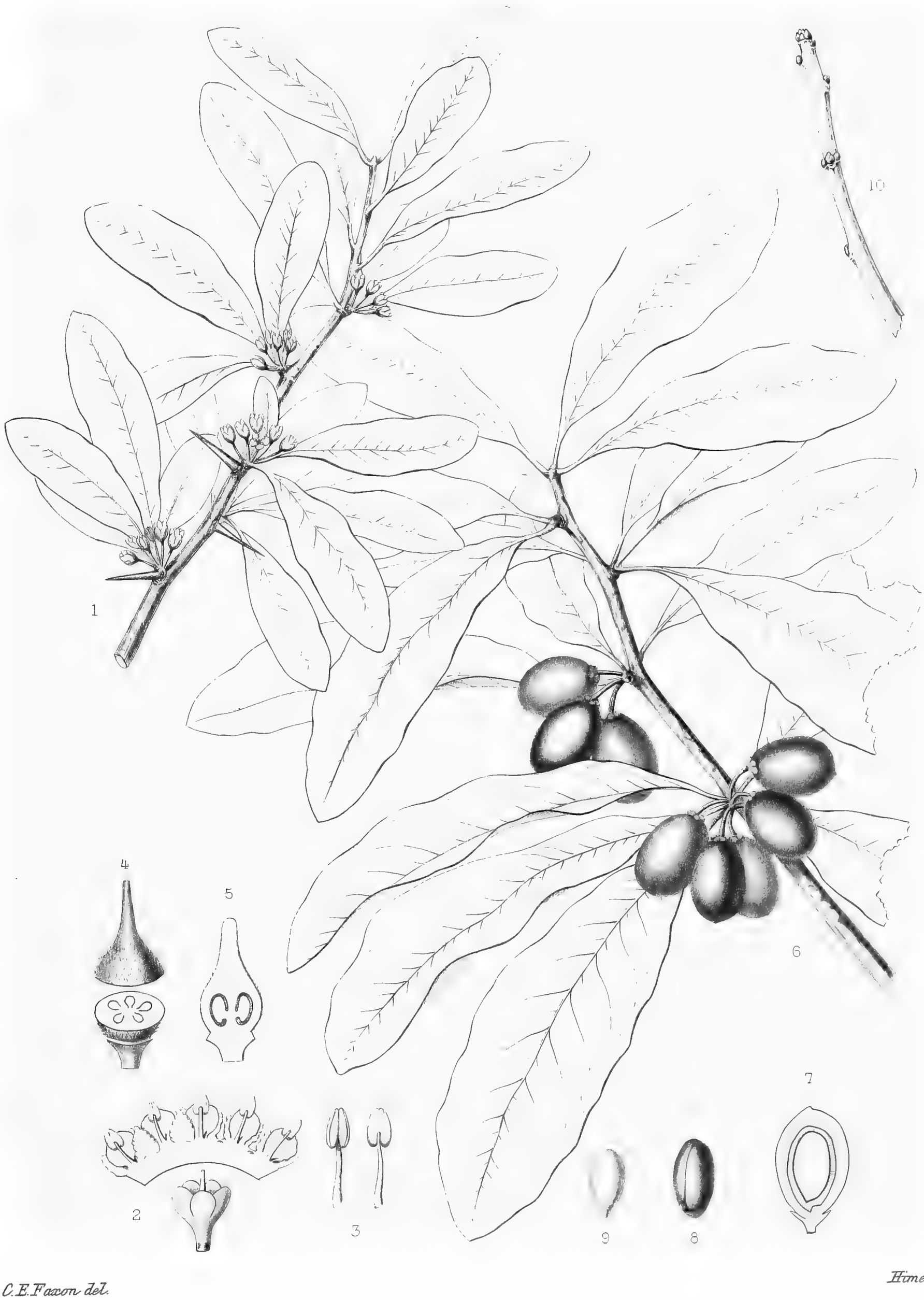
[2] *Hort. Kew.* i. 262 (Sideroxylon). — Loudon, *Arb. Brit.* ii. 1193, f. 1016.

in 1758 in the Physic Garden at Chelsea near London. It is still an occasional inhabitant of botanic gardens.

EXPLANATION OF THE PLATE.

PLATE CCXLVIII. BUMELIA LYCIOIDES.

1. A flowering branch, natural size.
2. A flower, the corolla displayed, enlarged.
3. Front and rear views of a stamen, enlarged.
4. An ovary divided transversely, enlarged.
5. Vertical section of an ovary, enlarged.
6. A fruiting branch, natural size.
7. Vertical section of a fruit, slightly enlarged.
8. A seed, slightly enlarged.
9. An embryo, slightly enlarged.
10. A winter branchlet, natural size.



C.E. Faxon del. Himely sc.

BUMELIA LYCIOIDES, Gærtn. f.

A. Riocreux direx.t Imp. R. Taneur, Paris

BUMELIA ANGUSTIFOLIA.

Ants' Wood. Downward Plum.

LEAVES spatulate or linear-oblanceolate to broadly obovate-cuneate, obtuse, coriaceous, obscurely venulose-reticulate.

Bumelia angustifolia, Nuttall, *Sylva*, iii. 38, t. 93 (1849). — Radlkofer, *Sitz. Math.-Phys. Cl. Acad. Münch.* xiv. pt. iii. 481. — Gray, *Syn. Fl. N. Am.* ed. 2, ii. 68. — Sargent, *Garden and Forest*, ii. 447. — Coulter, *Contrib. U. S. Nat. Herb.* ii. 257 (*Man. Pl. W. Texas*).

Bumelia reclinata, Torrey, *Bot. Mex. Bound. Surv.* 109 (not Ventenat) (1859).

Bumelia parvifolia, Chapman, *Fl.* 275 (not A. de Candolle) (1865).

Bumelia cuneata, Gray, *Syn. Fl. N. Am.* ii. 68 (not Swartz) (1878). — Hemsley, *Bot. Biol. Am. Cent.* ii. 297. — Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix. 103.

A tree, sometimes twenty feet in height, with a short trunk rarely exceeding six or eight inches in diameter, graceful pendulous branches which form a compact round head, and rigid spinescent diverging lateral branchlets often armed with acute slender spines sometimes an inch in length; or occasionally in Texas a low shrub with spreading stems. The bark of the trunk varies from one third to one half of an inch in thickness, and is gray tinged with red and deeply divided by longitudinal and cross fissures into oblong or nearly square plates. The branchlets, when they first appear, are thickly coated with loose pale or dark brown tomentum which soon disappears, and they become light brown tinged with red or ashy gray. The winter-buds are ovate, acute, and coated with rufous tomentum. The leaves are spatulate or linear-oblong, or sometimes broadly obovate-cuneate, rounded and occasionally emarginate at the apex, gradually narrowed at the base, and entire, with slightly thickened and revolute margins; they are glabrous, thick, and coriaceous, pale blue-green on the upper, and paler on the lower surface, an inch to an inch and a half long and a quarter of an inch to an inch and a quarter wide, with slender pale midribs and very obscure veins and veinlets; they are borne on petioles which are rarely a quarter of an inch in length, and usually remain on the branches until the end of their second winter. The flowers, which generally appear in October and November, barely exceed one sixteenth of an inch in length, and are borne in few or many-flowered crowded fascicles on slender glabrous pedicels seldom more than half an inch long. The calyx is glabrous and divided nearly to the base into narrow ovate lobes rounded at the apex and half the length of the divisions of the corolla, which are furnished with linear-lanceolate appendages as long as the ovate acute denticulate staminodia. The ovary is narrowly ovate, slightly hairy at the very base only, and gradually contracted into an elongated style. The fruit is oblong-oval and two thirds of an inch in length, with thick sweet flesh; it hangs on a slender drooping stem, usually only one fruit being developed from each fascicle of flowers, and ripens in the spring.

In Florida *Bumelia angustifolia* is distributed on the east coast, where it is common, from the shores of Indian River to the southern keys, and on the west coast, where it is much less abundant, from Cedar Keys to Cape Romano, being most frequently found on rocky shores and in the interior of low barren islands. It also inhabits the Bahama Islands,[1] the valley of the Rio Grande below Laredo, Texas, and Nuevo Leon.

The wood of *Bumelia angustifolia* is heavy, hard, although not strong, and very close-grained, with a satiny surface susceptible of receiving a beautiful polish; it contains many thin medullary rays,

[1] Eggers, No. 4418; an unusually narrow-leaved form.

and is light brown or orange-colored, with thick lighter colored sapwood. The specific gravity of the absolutely dry wood is 0.7959, a cubic foot weighing 49.60 pounds.

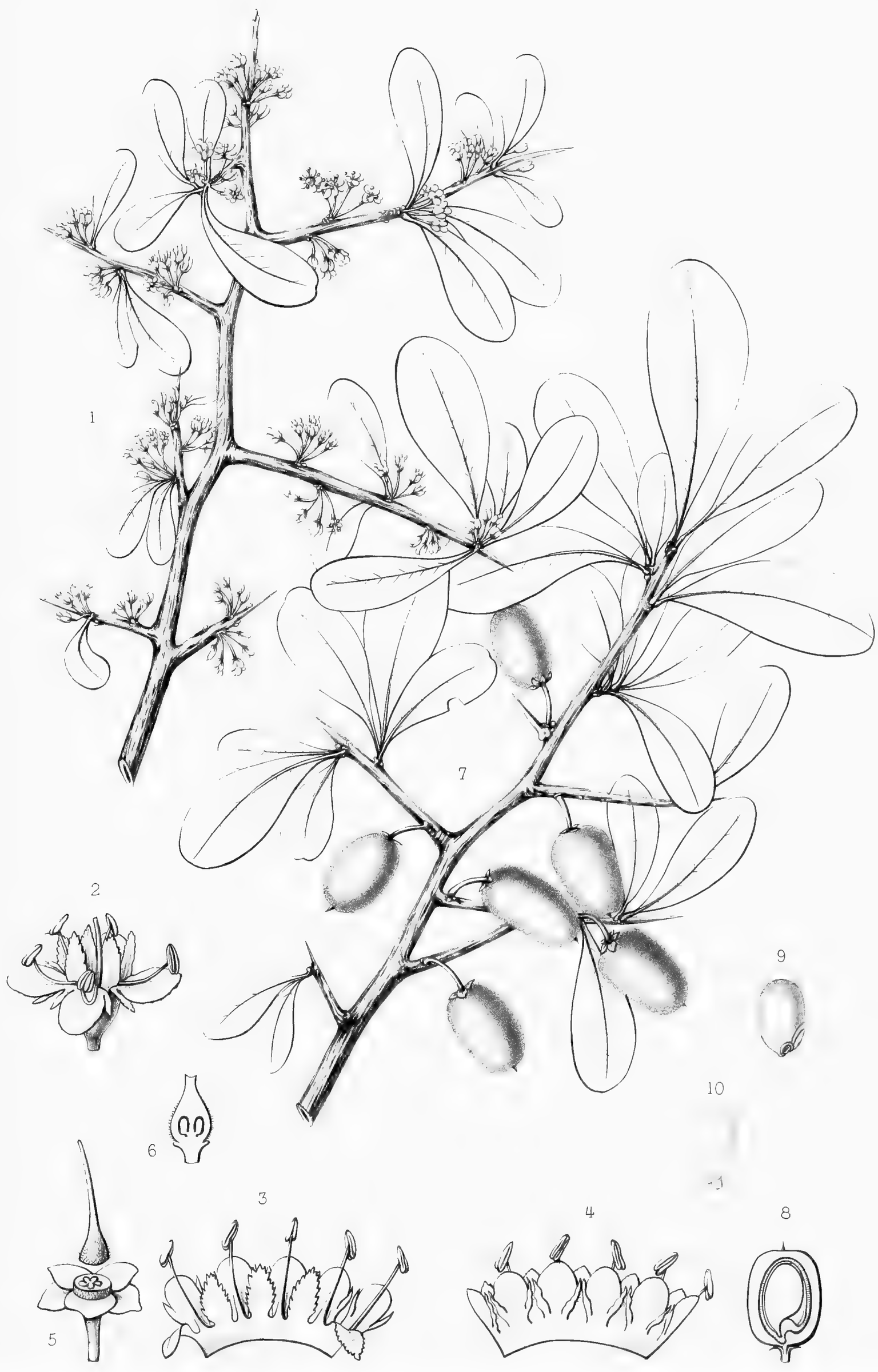
Bumelia angustifolia was first discovered on Key West by Dr. J. L. Blodgett. In the valley of the Rio Grande it was first collected near the city of Matamoras by Jean Louis Berlandier.[1]

[1] See i. 82.

EXPLANATION OF THE PLATE.

PLATE CCXLIX. BUMELIA ANGUSTIFOLIA.

1. A flowering branch, natural size.
2. A flower, enlarged.
3. Interior view of a corolla displayed, enlarged.
4. Exterior view of a corolla displayed, enlarged.
5. A flower, the corolla removed, with the ovary cut transversely, enlarged.
6. Vertical section of an ovary, enlarged.
7. A fruiting branch, natural size.
8. Vertical section of a fruit, natural size.
9. A seed, slightly enlarged.
10. An embryo, slightly enlarged.



C.E. Faxon del.

Toulet sc.

BUMELIA ANGUSTIFOLIA, Nutt.

A. Riocreux direx.t

Imp. R. Taneur, Paris.

DIPHOLIS.

Flowers perfect; calyx 5-lobed, the lobes in one series, imbricated in æstivation, persistent; corolla gamopetalous, 5-lobed, the lobes furnished with lateral petal-like appendages and staminodia, imbricated in æstivation; stamens 5; disk 0; ovary superior, 5-celled; ovules solitary in each cell, ascending. Fruit a fleshy usually 1-celled 1-seeded berry. Leaves alternate, petiolate, coriaceous, persistent, destitute of stipules.

Dipholis, A. de Candolle, *Prodr.* viii. 188 (1844). — Bentham & Hooker, *Gen.* ii. 660. — Engler & Prantl, *Pflanzenfam.* iv. pt. i. 145.

Bumelia, Baillon, *Hist. Pl.* xi. 277 (in part) (1891).

Glabrous or pubescent trees or shrubs, with terete unarmed branches and naked buds. Leaves coriaceous, elliptical to oblong-lanceolate, acuminate, short-petiolate, penniveined, the slender veins arcuate and united near the margins, entire, lustrous, persistent. Flowers minute, short-pedicellate, in many-flowered fascicles in the axils of existing leaves or from the leafless nodes of previous years. Pedicels clavate, ebracteolate, from the axils of minute deciduous bracts. Calyx ovate, deeply five-lobed, the lobes nearly equal, ovate, rounded at the apex. Corolla campanulate, short-tubed, hypogynous, white, five-lobed, the spreading lobes furnished on each side at the base with exterior linear or subulate appendages. Stamens five, inserted toward the base of the corolla-tube opposite its lobes, exserted; filaments filiform; anthers ovate or oblong-sagittate, attached on the back, extrorse, two-celled, the cells opening longitudinally. Staminodia five, petaloid, ovate, acute, mostly erosely or fimbriately cut on the margins, oblique, keeled on the back, inserted in the same rank and alternately with the stamens. Ovary oblong or narrowly ovate, gradually contracted into a slender style shorter than the corolla and stigmatic at the apiculate apex; ovules solitary in each cell, attached to an axile placenta, ascending from near the bottom of the cell, anatropous; raphe dorsal; micropyle inferior. Fruit ovate or oblong, tipped with the remnants of the persistent style, mostly one-seeded; pericarp thin and fleshy. Seed ovate or subrotund; testa thick, coriaceous, and lustrous; hilum oblong, basilar or slightly lateral. Embryo erect in thick fleshy albumen; cotyledons ovate, flat, much longer than the short terete radicle turned towards the hilum.

Dipholis, which differs chiefly from Sideroxylum in the presence of the exterior appendages to the corolla-lobes and from Bumelia in the copious albumen of the seed, is West Indian[1] and Floridian. Of three species which are recognized, one inhabits southern Florida.

Dipholis produces strong hard wood, but is not known to be otherwise valuable.

The generic name, from δίς and φολίς, relates to the appendages of the corolla.

[1] A. de Candolle, *Prodr.* viii. 188. — Grisebach, *Fl. Brit. W. Ind.* 400.

DIPHOLIS SALICIFOLIA.

Bustic. Cassada.

FLOWER-CLUSTERS shorter than the petioles. Leaves oblong-lanceolate or obovate, gradually contracted into slender petioles.

Dipholis salicifolia, A. de Candolle, *Prodr.* viii. 188 (1844). — Delessert, *Icon. Select.* v. 17, t. 40. — Miquel, *Martius Fl. Brasil.* vii. 45, t. 18. — Chapman, *Fl.* 274. — Gray, *Syn. Fl. N. Am.* ii. 67. — Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix. 101.

Achras salicifolia, Linnæus, *Spec.* ed. 2, 470 (1762).

Bumelia salicifolia, Swartz, *Prodr.* 50 (1788); *Fl. Ind. Occ.* i. 491. — Willdenow, *Spec.* i. pt. ii. 1086 (excl. *Sideroxylum Mastichodendron*). — Aiton, *Hort. Kew.* ed. 2, ii. 13. — Roemer & Schultes, *Syst.* iv. 494. — Don, *Gen. Syst.* iv. 29. — Dietrich, *Syn.* i. 621.

Sideroxylum salicifolium, Lamarck, *Ill.* ii. 42 (1793). — Gærtner f. *Fruct.* iii. 124, t. 202.

A tree, in Florida sometimes forty to fifty feet in height, with a straight trunk eighteen or twenty inches in diameter, slender upright branches forming a narrow graceful head, and thin terete branchlets. The bark of the trunk is a third of an inch thick and is broken into thick square plate-like brown scales tinged with red. The branches, when they first appear, are coated with rufous pubescence, and later become ashy gray or light brown tinged with red, and are marked by numerous circular pale lenticels and by small elevated orbicular leaf-scars, displaying near the centre a compact cluster of fibro-vascular bundle-scars. The leaves are oblong-lanceolate or narrowly obovate, acute, acuminate, or rounded at the apex, gradually contracted at the base, and entire, with slightly thickened cartilaginous wavy margins; when they unfold they are thickly coated with lustrous rufous pubescence, and at maturity are thin and firm, dark green and lustrous on the upper surface, pale yellow-green on the lower, three to five inches long, half an inch to an inch and a quarter broad, and glabrous or slightly puberulous on the lower side of the narrow pale midribs, with inconspicuous veins, reticulate veinlets, and slender petioles varying from half an inch to an inch in length; they appear in Florida in the spring and remain on the branches between one and two years. The flowers, which open during March and April, are an eighth of an inch long, and, produced in dense many-flowered fascicles crowded on the branchlets of the year or of the previous year for a distance of eight or twelve inches, are borne on thick pedicels a quarter of an inch long, coated with rufous pubescence and developed from the axils of ovate acute scarious bracts barely a twelfth of an inch in length. The calyx is half the length of the corolla, its outer surface being covered with rusty silky pubescence; the linear acute exterior appendages of the corolla-lobes are as long as the oval acute irregularly toothed staminodia, these being shorter than the stamens, which are composed of slender filaments and oblong anthers. The ovary is narrowly ovate, glabrous, and gradually contracted into a slender style shorter than the corolla and stigmatic at the apex. The fruit, which is solitary or rarely clustered, is produced in Florida rather sparingly and ripens in the autumn; it is oblong or subglobose, black, and a quarter of an inch long, with thin dry flesh and a single oblong seed.

Dipholis salicifolia grows in Florida on the shores of Bay Biscayne, on rich hummock soil, with the Mastic, the Live Oak, the Cuban Pine, the Palmetto, the Black Calabash, the Marlberry, the Gumbo Limbo, and *Eugenia Garberi*, and on several of the southern keys, although here it is nowhere common. It also inhabits the Bahamas[1] and many of the West Indian islands.[2]

The wood of *Dipholis salicifolia* is very heavy, exceedingly hard, strong, close-grained, and

[1] Hitchcock, *Rep. Missouri Bot. Gard.* iv. 104.

[2] A. Richard, *Fl. Cub.* iii. 85, t. 54bis. — Grisebach, *Fl. Brit. W. Ind.* 401; *Cat. Pl. Cub.* 164.

susceptible of receiving a beautiful polish; it contains numerous large open ducts and obscure medullary rays, and is dark brown or red, with thin sapwood composed of four or five layers of annual growth. The specific gravity of the absolutely dry wood is 0.9316, a cubic foot weighing 58.06 pounds.

Dipholis salicifolia appears to have been discovered in Jamaica by Sir Hans Sloane, and the earliest description of it is found in his Catalogue of Jamaica Plants, published in 1696.[1] In Florida it was detected by Dr. J. L. Blodgett.

[1] *Salicis folio lato splendente, arbor floribus parvis pallide luteis pentapetalis è ramulorum lateribus confertim exeuntibus*, 170; *Nat. Hist. Jam.* ii. 98, t. 206, f. 2. *Achras? Foliis oblongis nitidis utrinque productis, floribus confertis, fasciculis infra frondes sparsis*, Browne, *Nat. Hist. Jam.* 201, t. 17, f. 4.

EXPLANATION OF THE PLATE.

PLATE CCL. DIPHOLIS SALICIFOLIA.

1. A flowering branch, natural size.
2. Diagram of a flower.
3. A flower, enlarged.
4. A flower, with the corolla displayed, enlarged.
5. Vertical section of an ovary, enlarged.
6. An ovule, much magnified.
7. A fruiting branch, natural size.
8. Vertical section of a fruit, enlarged.
9. A seed, enlarged.
10. An embryo, much magnified.

C.E Faxon del. *Rapine sc.*

DIPHOLIS SALICIFOLIA, A.DC.

A. Riocreux direx.t *Imp. R. Taneur, Paris.*

MIMUSOPS.

FLOWERS perfect; calyx 6 to 8-parted, the divisions in two series, those of the exterior valvate in æstivation, the others imbricated, persistent; corolla gamopetalous, 6 to 8-lobed, the lobes imbricated or subcontorted in æstivation and furnished at the base with a pair of petal-like appendages and with scale-like or petaloid staminodia; stamens 6 to 8; disk 0; ovary superior, 6 to 8-celled; ovules solitary in each cell. Fruit a globose, usually 1-seeded berry. Leaves alternate, coriaceous, persistent, destitute of stipules.

Mimusops, Linnæus, *Amœn.* i. 397 (1749). — A. L. de Jussieu, *Gen.* 152. — Meisner, *Gen.* 251. — Endlicher, *Gen.* 741. — Bentham & Hooker, *Gen.* ii. 661. — Hartog, *Jour. Bot.* xvii. 358. — Engler & Prantl, *Pflanzenfam.* iv. pt. i. 150, f. 82. — Baillon, *Hist. Pl.* xi. 303 (in part).
Manilkara, Adanson, *Fam. Pl.* ii. 166 (1763).
Binectaria, Forskål, *Fl. Ægypt.-Arab.* 82 (1775).
Stisseria, Scopoli, *Introd.* 199 (1777).
Imbricaria, A. L. de Jussieu, *Gen.* 152 (1789). — Meisner, *Gen.* 251. — Endlicher, *Gen.* 741. — Bentham & Hooker, *Gen.* ii. 661.
?Phlebolithis, Gærtner, *Fruct.* i. 201, t. 43, f. 2 (1788).
Synarrhena, Fischer & Meyer, *Bull. Acad. Sci. St. Pétersbourg*, viii. 255 (1841). — Endlicher, *Gen.* Suppl. iii. 81.
Delastrea, A. de Candolle, *Prodr.* viii. 195 (not Tulasne) (1844).
Labramia, A. de Candolle, *Prodr.* viii. 672 (1844).
Eichleria, Hartog, *Jour. Bot.* xvi. 72 (not Progel) (1878).
Muriea, Hartog, *Jour. Bot.* xvi. 145 (1878).

Trees, or rarely shrubs, with stout terete unarmed branches, scaly buds, and sweet milky juice. Leaves alternate, usually clustered at the ends of the branches, petiolate, penniveined, with slender inconspicuous transverse veins and minutely reticulated veinlets, persistent. Flowers small, pedicellate from leaf-bearing or older leafless nodes. Pedicels clavate, short or elongated, ebracteolate, produced from the axils of minute deciduous bracts. Calyx six to eight-lobed, the lobes in two series. Corolla hypogynous, white, barely longer than the calyx, subrotate, usually dilated in the throat, the divisions ovate-lanceolate, acute, entire or variously cut, each furnished at the base on either side with an exterior petaloid appendage. Stamens inserted on the tube of the corolla opposite its lobes; filaments short, dilated, free, or united with the staminodia into a spreading tube; anthers lanceolate, attached on the back below the middle, extrorsely or sublaterally dehiscent, two-celled, the cells opening longitudinally, the connective excurrent, acute, or sometimes aristate at the apex. Staminodia as many as the lobes of the corolla, scale-like or petaloid, entire, two-lobed or laciniate, inserted in the same rank and alternately with the stamens. Ovary ovate, hirsute or puberulous, six to eight-celled, gradually narrowed into a slender style stigmatic at the apex; ovules solitary, attached to an axile placenta projected from the inner angle of the cell, subbasilar, ascending or horizontal, anatropous; raphe dorsal; micropyle inferior. Fruit globose or slightly obovate, one or few-seeded by abortion, tipped with a thickened persistent style, and surrounded at the base by the calyx; epicarp crustaceous, indurate; endocarp thick and fleshy. Seed oblong-ovate, slightly compressed; testa crustaceous or hard, chestnut-brown, lustrous; hilum elongated and lateral, or minute and basilar. Embryo surrounded by thick fleshy albumen; cotyledons flat, thick, and fleshy, much longer than the short terete erect radicle.

Mimusops, with thirty or forty species,[1] is widely distributed through the tropics of the two hemi-

[1] A. de Candolle, *Prodr.* viii. 202. — Walpers, *Rep.* vi. 456; *Ann.* iii. 13. — A. Richard, *Tent. Fl. Abyss.* ii. 22. — Sonder, *Linnæa*, xxiii. 74. — Miquel, *Martius Fl. Brasil.* vii. 39; *Fl. Ind. Bat.* ii. 1042. — Grisebach, *Fl. Brit. W. Ind.* 400. — Bentham, *Fl. Australi.* iv. 284. — Oliver, *Fl. Trop. Afr.* iii. 505, 508 (Imbricaria). — Kurz, *Forest Fl. Brit. Burm.* ii. 122. — Baker, *Fl. Maur. and Seych.* 194. — Hooker f. *Fl. Brit. Ind.* iii. 548. — Engler, *Bot. Jahrb.* xii. 523.

spheres, a single species inhabiting the islands of southern Florida. Several species of Mimusops produce hard heavy timber, fragrant flowers, edible fruits, and valuable milky juices. *Mimusops Balata*,[1] the Bully-tree or Balata of the West Indies and Guiana, where it grows to the height of a hundred feet and produces trunks six feet in diameter, is a valuable timber-tree;[2] it yields a small deliciously flavored fruit, and abundant sweet milky juice which is used as food by the natives of Guiana, and in recent years has been imported into the United States and Europe in the form of an elastic ductile gum, the balata of commerce.[3] In India *Mimusops hexandra*[4] is often cultivated as a fruit-tree, and its hard tough even grained wood is used in the construction of buildings, in turnery, and for gun-stocks.[5] *Mimusops Elengi*,[6] a native of southern India and Ceylon, is also cultivated in India and Burmah for its fragrant star-shaped flowers, which are used in garlands, and for its edible fruit; oil is pressed from its seeds, and its bark is used medicinally in native practice.[7] *Mimusops Kauki*[8] of Burmah, the Malay Peninsula and Archipelago, and of Australia, is often cultivated in tropical countries as a fruit-tree;[9] and *Mimusops parvifolia*[10] of Australia exudes a thick milky edible sap with the taste of fresh cream.[11]

The significance of the generic name, from μῖμώ and ὄψις, given in allusion to the shape of the corolla, is not apparent.

[1] Gærtner f. *Fruct.* iii. 133, t. 205 (1805). — A. de Candolle, *Prodr.* viii. 206. — Miquel, *Martius Fl. Brasil.* vii. 44. — Beauvisage, *Origines Botaniques de la Gutta-Percha*, 54.

Achras Balata, Aublet, *Pl. Guian.* i. 308 (1775).

? Mimusops globosa, Gærtner f. *l. c.* 132, t. 205 (1805). — Grisebach, *Fl. Brit. W. Ind.* 400.

Sapota Mulleri, Bleekrod, *Ann. Sci. Nat.* sér. 4, vii. 225 (1857).

[2] R. Schomburgk, *A Description of British Guiana*, 33. — Laslett, *Timber and Timber-trees*, 160.

[3] Balata-gum when dried resembles leather and is heavier than water. Treated with sulphur it forms a vulcanized elastic supple substance intermediate in its properties between gutta-percha and India-rubber. When first introduced it was extensively employed for isolating telegraph wires; its lack of durability when exposed to the air, however, lessens its value for this purpose, and it is now little used except as an ingredient in chewing-gum, for which purpose its sweetness and excellent masticatory qualities make it valuable. To obtain the gum the coarse outer bark is removed from the trees and a number of oblique insertions are made in the inner bark to the height of about seven feet from the ground; a ring of clay wrapped around the base of the tree collects the sap as it flows from the cuts. The quantity of sap obtained from a tree varies from six to thirty ounces, which produce from three quarters of a pound to a pound of the dried gum. This process, it is said, does not injure the trees. They are often cut down, however, and the sap extracted from wounds made along the whole length of the trunks; in this way as much as forty-five pounds of dried gum have been obtained from a single tree, while the average amount is eleven pounds. (See Bleekrod, *l. c.* 220. — Martius, *Fl. Brasil.* vii. 112. — Guibourt, *Hist. Drog.* ed. 7, ii. 600. — Spons, *Encyclopædia of the Industrial Arts, Manufactures, and Raw Commercial Products*, ii. 1635. — Jackson, *Commercial Botany of the Nineteenth Century*, 33.)

[4] Roxburgh, *Pl. Corom.* i. 16, t. 15 (1795). — A. de Candolle, *l. c.* 204. — Hooker f. *Fl. Brit. Ind.* iii. 549.

Mimusops Indica, A. de Candolle, *l. c.* 205 (1844). — Thwaites, *Enum. Pl. Zeylan.* 175. — Brandis, *Forest Fl. Brit. Ind.* 291.

[5] Brandis, *l. c.* — Balfour, *Timber-trees of India*, ed. 2, 168; *Encyclopædia of India*, ed. 3, ii. 950.

[6] Linnæus, *Spec.* 349 (1753). — Roxburgh, *l. c.* 15, t. 14. — Gærtner, *Fruct.* i. 198, t. 42. — A. de Candolle, *l. c.* 202. — Thwaites, *l. c.* — Brandis, *l. c.* 293. — Kurz, *l. c.* — Hooker f. *l. c.* 548.

[7] Beddome, *Fl. Sylv. S. Ind.* i. t. 40. — Balfour, *l. c.* 167; *l. c.*

[8] Linnæus, *l. c.* (1753). — R. Brown, *Prodr.* 531. — A. de Candolle, *l. c.* 203. — Miquel, *Fl. Ind. Bat.* ii. 1042. — Hooker f. *l. c.* 549.

Mimusops dissecta, R. Brown, *l. c.* (1810). — *Bot. Mag.* lix. t. 3157. — A. de Candolle, *l. c.* 204.

Mimusops Balota, Blume, *Bijdr. Fl. Ned. Ind.* 673 (not Gærtner f.) (1825).

Mimusops Kauki, var. *Browniana*, A. de Candolle, *l. c.* 203 (1844).

Mimusops Hookeri, A. de Candolle, *l. c.* 204 (1844).

Mimusops Browniana, Bentham, *Fl. Austral.* iv. 285 (1869).

[9] Brandis, *l. c.*

[10] R. Brown, *l. c.* (1810). — A. de Candolle, *l. c.* 203. — Mueller, *Fragm. Phyt. Austral.* v. 160. — Bentham, *l. c.*

[11] Maiden, *Useful Native Plants of Australia*, 45.

MIMUSOPS SIEBERI.

Wild Dilly.

STAMINODIA scale-like, triangular, entire. Leaves elliptical-oblong or slightly obovate, retuse.

Mimusops Sieberi, A. de Candolle, *Prodr.* viii. 204 (1844). — Chapman, *Fl.* 275. — Gray, *Syn. Fl. N. Am.* ii. 69. — Sargent, *Forest Trees N. Am.* 10*th Census U. S.* ix. 103.

Achras Zapotilla, var. **parviflora**, Nuttall, *Sylva*, iii. 28, t. 90 (1849).

Mimusops dissecta, Grisebach, *Fl. Brit. W. Ind.* 400 (in part) (1864).

Achras Bahamensis, Baker, *Hooker Icon.* xviii. t. 1795 (1888).

Mimusops Floridana, Engler, *Bot. Jahrb.* xii. 524 (1890).

A tree, in Florida rarely more than thirty feet in height, with a short gnarled trunk twelve or fifteen inches in diameter, usually hollow and defective, and stout branches and branchlets which form a compact round head. The bark of the trunk is a quarter of an inch thick, and is irregularly divided by deep fissures into ridges rounded on the back and broken into small nearly square plates. The branchlets, which are clustered at the ends of the branches of the previous year, are coated, when they first appear, with dark rufous pubescence, and at the end of a few weeks are glabrous, or nearly so, and light orange-brown; in their second year they are stout, covered with thick ashy gray or light reddish brown scaly bark, and marked by the elevated obcordate leaf-scars, which display three large dark conspicuous fibro-vascular bundle-scars. The buds are ovate, acute, and covered with dark rusty brown tomentum. The leaves, which are clustered at the ends of the branchlets, are involute in vernation, elliptical-oblong or occasionally slightly obovate, rounded and retuse at the apex, rounded or wedge-shaped at the base, and entire, with slightly thickened revolute margins; when they unfold they are bright red and slightly puberulous on the under surface of the midribs, and at maturity are thick and coriaceous, bright green and lustrous, covered on the upper surface with a slight glaucous bloom, conspicuously reticulate-venulose, three to four inches long and an inch to an inch and a half broad, with stout midribs glabrous or puberulous with rusty hairs below and deeply impressed above; they are borne on slender grooved petioles from half an inch to an inch in length and usually covered with rusty pubescence, especially while young, and, appearing in Florida in April and May, fall during their second year. The flowers, which open in the spring, are borne on slender pedicels, coated with rusty tomentum, an inch or more long, and produced at the ends of the branches from the axils of leaves of the previous year, or from those of leaves two years old which have fallen. The flower-buds are ovate, rounded at the apex, and clothed with rusty tomentum. The calyx is narrowly ovate, and divided nearly to the bottom into six lobes; the lobes of the outer row are lanceolate, acute, covered on the outer surface with rusty brown tomentum and on the inner with pale pubescence, and thickened at the base, where they are usually marked on the outer surface with a black spot; those of the inner row are ovate, acute, keeled towards the base, light greenish yellow and covered with pale pubescence. The corolla is light yellow, tinged with green, and two thirds of an inch across when expanded, with six spreading lanceolate acute divisions, entire, or erosely toothed towards the apex, and furnished at the base on each side with a slender acute appendage one half or two thirds of their length. The staminodia are minute, nearly triangular, entire, and free from the stamens. The ovary is narrowly ovate, dark red, puberulous toward the base with pale hairs, and gradually narrowed into an elongated exserted style stigmatic at the apex. The fruit is subglobose or slightly obovate, flattened and compressed at the apex, surrounded at the base by the remnants of the persistent calyx with its reflexed lobes, and

crowned by the thickened persistent style; it is an inch or an inch and a half in diameter, and is borne on a stout erect stem an inch or more long, and, ripening at the end of a year in the spring or early autumn, is still on the branches when the tree is again in flower; the fruit is usually one-seeded by abortion, and is covered with a thick dry outer coat, roughened with minute, russet-brown scales, and inclosing the thick spongy flesh filled with milky juice. The seed is half an inch long, with an elongated lateral hilum. The fruit is devoured by many birds and other animals.

The wood of *Mimusops Sieberi* is very heavy, hard, strong, and close-grained, with numerous obscure medullary rays. It is rich very dark brown, with lighter colored sapwood. The specific gravity of the absolutely dry wood is 1.0838, a cubic foot weighing 67.54 pounds.

Mimusops Sieberi is found in Florida only on the southern keys, where it is not uncommon; it also inhabits the Bahamas,[1] and probably many of the other West Indian islands.

The specific name commemorates the scientific labors of F. W. Sieber,[2] the botanical traveler and collector, who found this tree on the island of Trinidad.

The Wild Dilly was discovered on the Bahama Islands by Mark Catesby, who published the earliest description of it in his *Natural History of Carolina*.[3]

[1] Hitchcock, *Rep. Missouri Bot. Gard.* iv. 104.

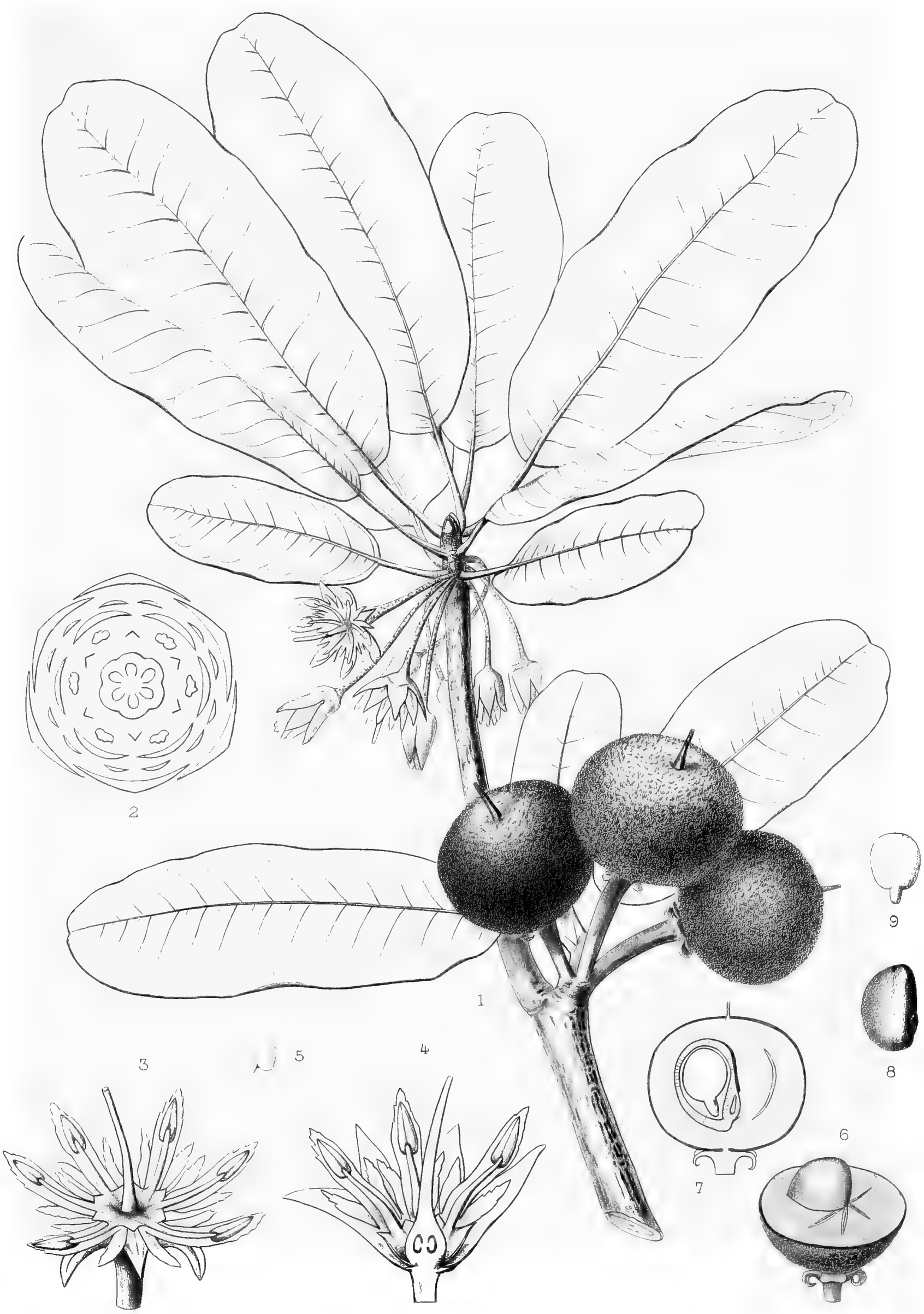
[2] Franz Wilhelm Sieber (1785–1844), a native of Prague and by profession an apothecary, who enriched the principal herbaria of Europe with plants collected in the Orient and in a journey round the world which he made in 1822–24.

[3] *Anona foliis Laurinis, in summitate incisis; fructu compresso scabro fusco, in medio acumine longo,* ii. 87, t. 87.

EXPLANATION OF THE PLATE.

PLATE CCLI. MIMUSOPS SIEBERI.

1. A flowering and fruiting branch, natural size.
2. Diagram of a flower.
3. A flower, enlarged.
4. Vertical section of a flower, enlarged.
5. An ovule, much magnified.
6. Cross section of a fruit, showing the seed, natural size.
7. Vertical section of a fruit, natural size.
8. A seed, natural size.
9. An embryo, enlarged.



C.E. Faxon del. Himely sc.

MIMUSOPS SIEBERI, A. DC.

A. Riocreux direx.t Imp. R. Taneur, Paris

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